KEFI MINERALS

TULU KAPI GOLD PROJECT STUDY UPDATE

Lycopodium

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DISCLAIMER

This report has been prepared for KEFI MINERALS (KEFI) by Lycopodium Minerals Pty Ltd (Lycopodium) as an independent consultant and is based in part on information provided by Lycopodium, in part by Knight Piésold, the consultant for the TSF and Water Dam, and on information furnished by KEFI. While it is believed that the information, conclusions and recommendations will be reliable under the conditions and subject to the limitations set forward herein, Lycopodium does not guarantee their accuracy. The use of this report and the information contained herein shall be at the user's sole risk, regardless of any fault or negligence of Lycopodium.

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LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

KEFI Minerals	KEFI
Lycopodium Minerals Pty Ltd	Lycopodium / Consultant
Australian Dollars	AUD
Capital Expenditure	CAPEX
Carbon In Leach	CIL
Definitive Feasibility Study	DFS
Engineering, Procurement and Construction	EPC
Euro	EUR
Front End Engineering and Design	FEED
Life Of Mine	LOM
Megawatt	MW
Micron	µm
Occupational Health and Safety	OH&S
Operating Expenditure	OPEX
Orway Mineral Consultants Pty Ltd	OMC
Semi-Autogenous Grinding	SAG
Tailings Storage Facility	TSF
Tulu Kapi	TK
United States Dollars	USD
Mining and Cost Engineering Pty Ltd	MACE

1.0 EXECUTIVE SUMMARY

This report has been compiled by Lycopodium Minerals Pty Ltd following the FEED scope undertaken by Lycopodium in late 2016 and as an update to the 2015 DFS report prepared by Senet. During the FEED period a number of initiatives were incorporated into the design to improve the robustness of the project. This report provides revised capital and operating costs for the project based on the Lycopodium FEED design and the development by Knight Piésold, as consultant to Lycopodium, of the conceptual design provided by KEFI Minerals for the Tailings Storage Facility (TSF) and Water Dams.

The key initiatives incorporated into this update are as follows:

- Mine operations to be undertaken by an experienced African mining contractor.
- Process plant capacity increased from 1.2 Mtpa to 1.5 Mtpa to treat lower grade stockpile ore earlier in the mine life.
- Target grind for processing plant increased to P_{80} = 150 µm.
- Processing plant comminution circuit refined and primary SAG mill and secondary Ball mill circuit replaced with larger SAG only circuit.
- Tailings Storage Facility (TSF) relocated downstream to reduce capital cost with no reduction in capacity for a neutral water balance.
- Main access road routes were refined to decrease capital costs.

For the purposes of this report the Geology, Mineralisation and Exploration approach remains as per the 2015 DFS. The information provided has been applied as is by Lycopodium in the development of the design and the plant capital and operating costs.

Subsequent to the 2015 DFS, the approach to mining operations has been reviewed by KEFI with a view to improving cash flows and achieving cost reductions where possible. The key initiatives incorporated are as follows:

- Mine operations to be undertaken by an experienced African mining contractor rather than the Owner.
- Rationalisation of pre-mining works to be undertaken by a separate earthmoving contractor during the construction period.
- Improve mining operations in consultation with the preferred mining contractor.
- Mill throughput was increased from 1.2 Mtpa to 1.5 Mtpa for normal operations and 1.7 Mtpa when processing softer ores.

The metallurgical testwork data remains as per that available and provided as part of the 2015 DFS. As part of the FEED, Lycopodium undertook a review of past metallurgical testwork samples, as well as the supervision and confirmation of comminution circuit design based on the different ore blends to be treated during the open pit Life of Mine (LOM) operations. The significant outcomes of this review are:

- The ability to increase the plant capacity from 1.2 Mtpa to 1.5 Mtpa.
- Increase the grind size from P_{80} = 75 µm to 150 µm for the fresh ore and 125 µm for the oxide ore, with only minor loss in gold recovery.
- Single stage SAG mill in place of the Ball and SAG mill in the 2015 DFS design.

The Lycopodium plant design is predicated on a name plate throughput of 1.5 - 1.7 Mtpa which is consistent with the performance warranty proposed in the EPC contract. Given the plant will initially be treating softer oxide ore and in a new state requiring reduced maintenance, an opportunity exists to operate the plant into the design margin and achieve 10% increase above nameplate. KEFI has highlighted the importance of avoiding the unnecessary build-up of ore stockpiles by running the plant below its capacity. If the plant is operated at 1.5 - 1.7 Mtpa, ore stocks will build requiring two additional years of processing following the conclusion of mining operations. In consideration of these opportunities, it is the reasonable intention of KEFI to finance for the Lycopodium design of 1.5 - 1.7 Mtpa, whilst planning their production at 10% higher annual throughput.

In addition to the key improvements already noted, further design development undertaken during the FEED period resulted in the following improvements:

- Replacement of the live coarse ore stockpile and reclaim feeders with a surge bin and ‘dead’ stockpile. The SAG mill feed will be withdrawn directly from the surge bin.
- The elution circuit capacity increases from 4 t to 6 t with the higher throughput.
- Quicklime dosed via the mill feed conveyor will be used in place of a hydrated lime system with wet make-up and distribution network.
- Removal of tower crane and inclusion of gantry crane arrangement.
- Relocation of administration and mine buildings.

Subsequent to the 2015 DFS and the design provided by Epoch Resources for the Tailing Storage Facility (TSF) and the Water Dams, further conceptual review and optimisation was undertaken by KEFI, via their consultant Increva Pty Ltd. As part of the scope of this update, Lycopodium engaged the services of Knight Piésold to develop the revised concept provided by KEFI and provide quantities for estimating purposes. The key outcomes of this review are as follows:

- TSF with 9 stages. Stage 1 being for 1.5 Mtpa and 1 year of operation. Stages 2 to 9 constructed by the KEFI mining contractor.
- 2 Water Dams, 0.58 and 0.332 Mm^3, to capture and provide water for the process plant and administration facilities.

Consideration of the timing of construction and the rainy seasons in the area will be required upon progression into the execution phase of the project. There are residual risks that remain in relation to the design of the TSF and Water Dam, namely:

- Although a review of the ground conditions encountered at the proposed TSF and WD embankments show competent foundations for the facility embankments, further geotechnical information will need to be gathered during the execution phase prior to the detailed design to confirm the ground conditions.

- Timely construction of the water catchment dams to capture two rainy seasons for start-up operations as per the current baseline plan.

The offsite infrastructure, environmental and social impact, and permitting, remain unchanged from the 2015 DFS for the purposes of this update.

The initial capital investment value for the Tulu Kapi project, excluding taxes, is US$161,243,432. Below is a summary of costs.

Table 1.1 Summary of Costs

Description	Initial Capital US$	Sustaining Capital US$	Total Capital US$
EPC Total Price	69,424,841		69,424,841
EPC Adjustment resulting from scope change	1,472,515		1,472,515
Revised EPC Value	70,897,356		70,897,356
EPCM Scope of Works			0
Bulk Earthworks	14,582,574	10,506,045	25,088,619
Other Allowances	970,000		970,000
Contingency	3,110,515	2,101,209	5,211,724
First Fill and Spares	4,337,446		4,337,446
Mining Cost	15,823,000	1,097,000	16,920,000
Offsite Infrastructure Cost	15,671,000	473,000	16,144,000
Owners Cost	18,111,986		18,111,986
Other Cost	17,739,555	830,000	18,569,555
Closure Provision		9,483,393	9,483,393
Total	**161,243,432**	**24,490,647**	**185,734,079**

Further consideration as to the impact of taxes imposed on the project by an appropriately qualified tax advisor is ongoing by KEFI Minerals.

The operating costs have been updated to reflect the initiatives that have been adopted following the 2015 DFS. The Mining and General and Administration costs have been updated by KEFI, with the process operating costs provided by Lycopodium utilising operating and consumable costs provided by KEFI.

The LOM operating cost estimate is summarised Table 1.2 in operating costs are exclusive of taxes, selling and royalty's costs.

Table 1.2 LOM Operating Cost Estimate Summary (US$, 1Q17, ±15%)

Cost Centre	Total LOM Cost	
LOM Plant Feed 15.4 Mt	**US$M**	**US$/t Plant Feed**
Mining	441	28.64
Processing	133	8.67
General & Administration	88	5.69
Total	**662**	**43.00**

The implementation schedule produced during the FEED has been updated and included in this report for completeness. The overall project duration is approximately 30 months with a six month early works programme and 24 months duration for the main portion of the EPC. The schedule currently shows a first gold pour late in Q4 of 2019, dependent upon activities undertaken subsequent to this report.

At the time of preparation of this report, KEFI has commenced some of the schedule activities assumed in this report such as the recommended geotechnical investigation. In addition, KEFI have advised that based on the current site activities and the schedule being targeted by KEFI, the resettlement of the community should be three months earlier than that assumed herein. Further opportunities of schedule improvement, such as rationalisation and programming of bulk earthworks, may also be recognised as a result these early works

Subject to ongoing review and progress during the remainder of 2017, the schedule for mobilisation, construction and subsequent gold pour, it may be possible to recognise an improvement to the current baseline schedule of approximately three months.

2.0 INTRODUCTION

KEFI Minerals PLC ('KEFI') is a gold exploration and development company listed on the AIM Market of the London Stock Exchange (AIM:KEFI.L) focused on the exploration and concurrent development of the Tulu Kapi Gold Project in Western Ethiopia.

The Tulu Kapi Mine Licence was granted for 20 years in April 2015.

Since acquisition of the project, KEFI have tightened up the geological interpretation and mine planning and completed a revised DFS in June 2015 (the '2015 DFS') to re-evaluate the technical and economic characteristics of the Tulu Kapi Gold Project carried out by the previous owners Nyota Minerals Limited.

Subsequent to the positive 2015 DFS commissioned by KEFI, Lycopodium Pty Ltd was appointed as the nominated EPC contractor in 2016. During this period a number of additional initiatives have been undertaken to further improve the robustness of the project and introduce both improved cash flows and cost reductions.

This report outlines those initiatives and the subsequent refinements to the project costs. This report should be read in conjunction with the 2015 DFS.

2.1 Project Location

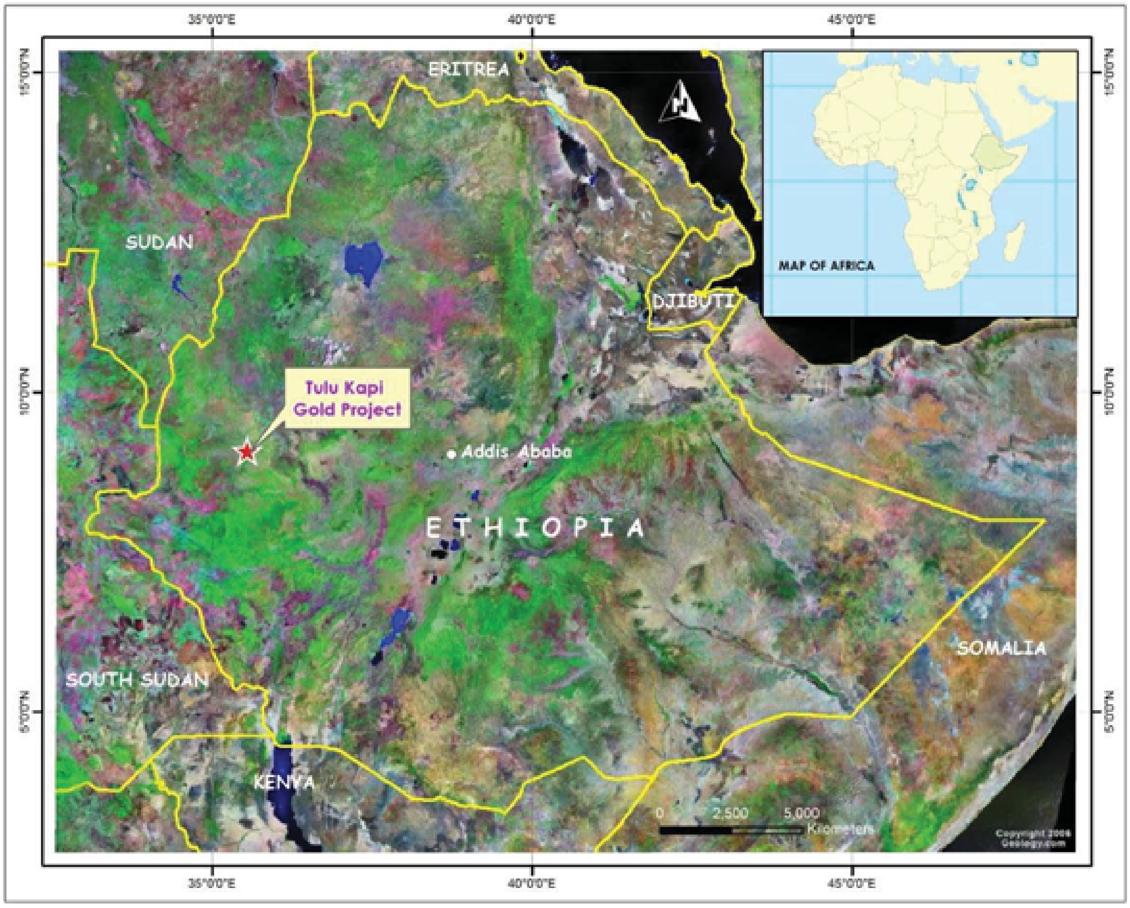
The Tulu Kapi Gold Project is located in Western Ethiopia, in the Western Wellega Zone of the Oromia Region approximately 360 km due west of the capital, Addis Ababa. The Project is accessible by road from Addis Ababa, a distance of 520 km with the final 15 km by means of an all-weather unpaved road running through the surrounding villages. The journey by road from Addis Ababa to Tulu Kapi takes approximately 10 hours.

The project area is approximately 9 km south of the village of Kelley, which is on the main road from Gimbi to Dembi Dollo. Regional population centres within easy road travel distance of the licence areas include Ayra, a small town about 20 km to the west, Gimbi, an important market town about 32 km to the east northeast, and Nekemte, a larger regional centre about 110 km to the east.

Chartered aircraft from Addis Ababa may land at an airstrip at Ayra Guliso, approximately 30 km by road from the project. Road travel from Ayra to the project site takes approximately 2 hours on a mix of gravel and dirt roads. Ethiopian Airlines operate scheduled flights three times a week to Assosa airport, a 4-hour drive from Tulu Kapi.

The project location area is shown as red in Figure 2.1.

Figure 2.1 Tulu Kapi Project Location



2.2 Project Description

The 7 km² Mining Licence Area is located in the Oromia National Regional State, Western Wellega Zone, Genji Woreda (Kapi Guracho and Bikiltu Ankore Kebele).

The project area is characterised by rounded hills and deeply incised valleys at elevations of between 1,550 and 1,770 metres above mean sea level.

The project site is located on a ridge forming a watershed which drains north and south. Drainage to the north is towards the Gurach and Kersa Rivers, which are sub-tributaries of the Birbir River. Drainage to the south is via the Chalte, Kumbo and Sarere rivers, which are sub-tributaries of the Baro and Blue Nile Rivers. The streams in the area are perennial but decrease to very low flow rates in the dry season. Groundwater in the project area is found in two aquifers. The upper unconfined aquifer is located in the saprolite, and the lower semi-confined aquifer is located deeper in the fractured bedrock. Groundwater flow is expected to mimic the surface topography and be controlled by surface water divides.

Land use is predominantly agricultural and the ridges are mainly left to grass for cattle. The hill sides are terraced for seasonal cropping of maize, teff, corn, and other staples. The incised valleys are overprinted by a forest ecosystem providing shade for coffee plantations.

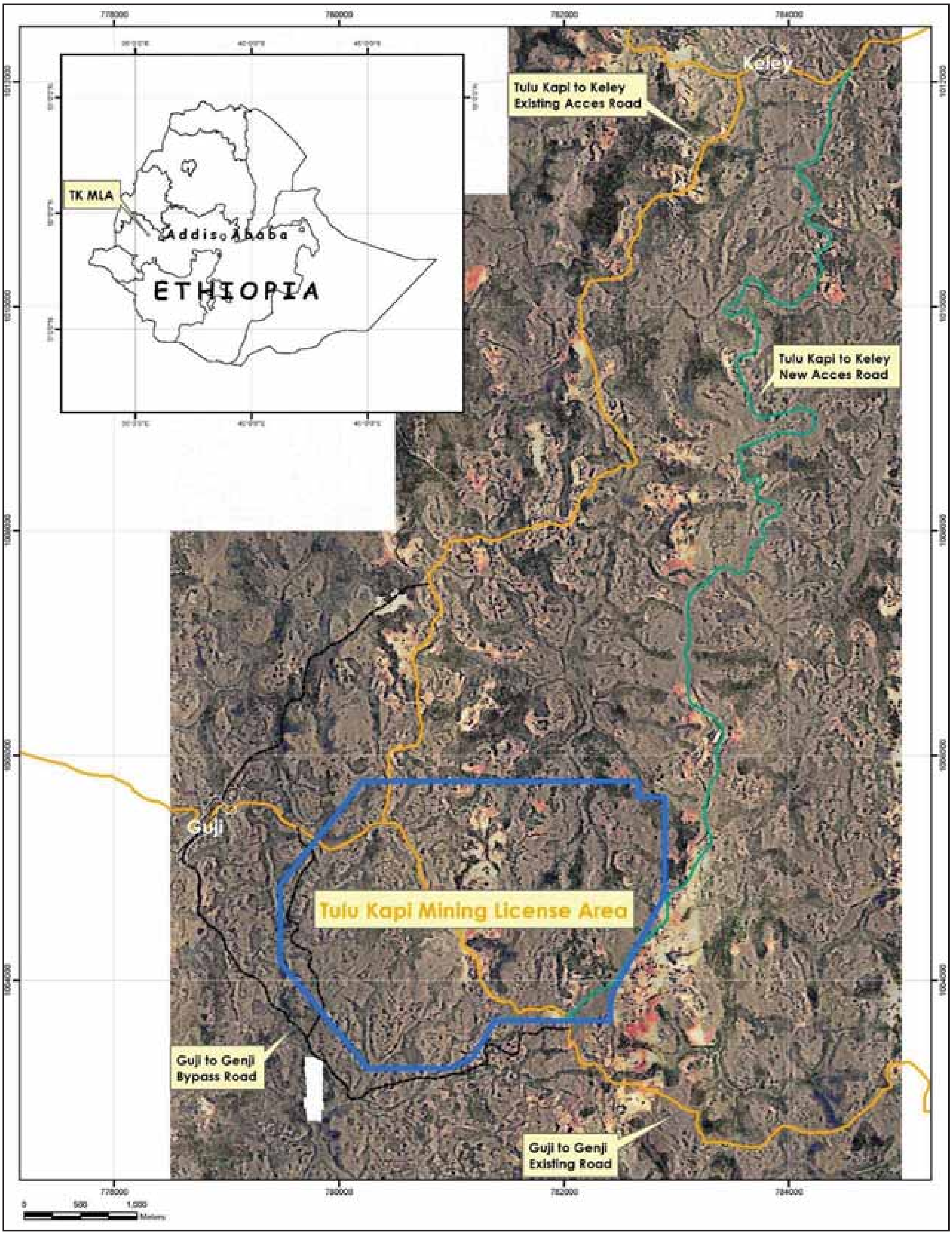
Rainfall is seasonal with a pronounced 'monsoon' period between July and September. Daily average high and low temperatures range from 32°C and 13°C in May immediately prior to the start of the rainy season, to 24°C and 14°C in July and August, which are the coldest months.

KEFI has been able to continue uninterrupted exploration throughout the year, including reduced activity during the wet season, and based on evidence to date there appears to be no reason why a commercial scale mining and processing operation cannot be conducted throughout the year.

The gold mineralisation at Tulu Kapi is hosted by an Upper Proterozoic age intrusive, which comprises a coarse-grained syenite pluton. These rocks have been intruded into a volcano-sedimentary sequence that was subsequently transformed to mafic and sericitic schists. The main Tulu Kapi deposit comprises a series of stacked gold-bearing quartz-carbonate veins, veinlets and stock work intimately associated with sub-horizontally dipping albite alteration zones.

Figure 2.2 shows the mining licence area for the Tulu Kapi Gold Project overlaid on an aerial photograph.

Figure 2.2 Tulu Kapi Mining Licence Area



2.3 Project History

Small-scale surface mining took place at Tulu Kapi in the 1930s, focussing on easily accessible gold-bearing saprolite on the flanks of the Tulu Kapi deposit. The total volume of material mined was modest and has had little or no impact on the project resource or future mining plans and there has been no history of persistent artisanal mining.

The earliest modern exploration of the Tulu Kapi area took place in the 1970s under the guidance of the United Nations Development Programme (UNDP), which undertook reconnaissance exploration over a wide area of western Ethiopia between 1969 and 1972. The work was largely reconnaissance level and regionally biased and included stream sediment and soil geochemical sampling, geophysical surveys, detailed geological mapping and diamond drilling.

Tan Range Exploration Company (TREC), a Canadian exploration company, acquired an exploration licence over an area that incorporated the Tulu Kapi deposit and undertook further exploration between 1996 and 1998, including a small amount of drilling.

The Tulu Kapi Licence was granted to Minerva Resources through its wholly owned subsidiary Golden Prospect Mining Company (GPMC) on 27 May 2005. GPMC undertook further detailed geological mapping, trenching, and geophysics and completed 34 diamond drill holes.

Minerva Resources (GPMC's parent company) was acquired by Dwyka Resources Limited (whose name was subsequently changed to Nyota Minerals Limited) in July 2009. GPMC therefore became a wholly owned subsidiary of Nyota.

Between July 2009 and September 2011, Nyota undertook an aggressive exploration and evaluation programme, which has been summarised by independent geological and mining consultants in several JORC-compliant mineral resource estimates and an NI 43-101 PEA.

Further extensive exploration and drilling allowed Nyota to complete an initial Definitive Feasibility Study in December 2012 ('2012 DFS') based on a 107 koz annual production scenario with a 2 Mtpa conventional CIL processing plant and initial capital expenditure (excluding working capital) totalling US$235 million.

KEFI Minerals Plc acquired 75% of the share capital of Nyota Minerals (Ethiopia) Ltd (NME), the owner of the Tulu Kapi Project and surrounding exploration licences, in December 2013. NME underwent a name change in 2014 to KEFI Minerals (Ethiopia) Ltd (KME). KEFI announced the acquisition of the remaining 25% of KME in June 2014. The sale was approved by Nyota Minerals Ltd shareholders in September 2014, giving KEFI 100% ownership of KME and the Tulu Kapi project. The Government of Ethiopia is entitled to a 5% free-carried interest.

Since December 2013, KEFI has conducted exploration and further drilling activities to update study documents for re-submission of a mining licence application (MLA) in October 2014.

The former exploration licence that encompasses the Tulu Kapi project was replaced by a Mining Licence on 13 April 2015. This licence gives KEFI the right to build and operate a mine. When the licence was issued, the Company also signed a Mineral Agreement with the Government of Ethiopia, which sets out the fiscal regime, taxation and royalties as they affect the operation of the mine. The licence and mineral agreement were signed by KEFI and the Company's wholly owned subsidiary in Ethiopia, and are valid for 20 years. The mining licence can be renewed, with each renewal subject to a maximum period of 10 years.

Following the acquisition of the project, KEFI decided to refine the 2012 DFS carried out by Nyota Minerals Ltd and reconfigured the conceptual project development approach and completed a revised DFS in June 2015 with emphasis on a smaller scale selective mining open-pit mine operation delivering 1.2 Mtpa of ore to a conventional 1.2 Mtpa CIL plant.

Highlights of the 2015 DFS are set out below:

- An initial funding requirement of approximately US$175 million, based on the planned use of owner-mining and an all-new processing plant.
- Conventional open-pit mining and straightforward process design incorporating a 1.2 Mtpa carbon-in-leach ('CIL') operation with a simple crushing and grinding circuit.
- Extensive metallurgical testwork confirmed that an overall recovery of 91.5% is achievable.
- Gold production of 960,000 ounces over 13 years with an average of approximately 75,000 ounces per annum.
- All in sustaining costs of circa US$780/oz.

2.4 Overview of Project Refinements Following DFS

Subsequent to the 2015 Tulu Kapi DFS a number of initiatives have been undertaken to improve the robustness of the project and introduce both improved cash flows and cost reductions. The main improvements on project economics are based on the following:

- Mine operations to be undertaken by an experienced African mining contractor.
- Process plant capacity increased from 1.2 Mtpa to 1.5 Mtpa by treating lower grade stockpile ore earlier in the mine life.
- Target grind for processing plant increased to P_{80} = 150 µm.
- Processing plant comminution circuit refined and primary SAG mill and secondary Ball mill circuit replaced with larger SAG only circuit.
- Tailings Storage Facility (TSF) was relocated downstream to reduce capital cost with no reduction in capacity for a neutral water balance.
- Main access road routes were refined to decrease capital costs.

2.4.1 Contract Mining

The DFS proposed to undertake mining on an owner operator basis. This would entail training a local workforce with a low or limited skill base to a level capable of achieving the high productivity rates typically required for a mining operation. It would also require the development and implementation of certain operational and maintenance management systems to ensure safe and reliable operation of the mining equipment. Whilst this scenario is still considered achievable there are inherent risks given Tulu Kapi will be the first mining project KEFI have undertaken. Coupled with this, a reduction in the initial capital cost would result from contract mining. As a consequence, it was decided that the mining operations should be undertaken by an experienced African mining contractor.

Five contractors were invited to submit budget pricing. Following the input from the preferred mining contractor regarding the mine plan and agreed mining costs, a number of refinements were made to the plans underlying the 2015 DFS and these were built into the final project plans and cash flow model.

2.4.2 Processing Plant Capacity Increase

Shortly after completion of the 2015 DFS, the Company opened the bidding process for the construction of the process plant and the operation of the mine (rather than operator mining as was original contemplated in the 2015 DFS). Several leading international firms were selected for the bidding process and the short listed firms visited the Tulu Kapi site in order to finalise their bids.

During the engagement process and following discussions with several of the short listed engineering contractors it became apparent that an increase in processing plant capacity from 1.2 Mtpa to 1.5 Mtpa could be achieved with negligible increases in capital costs and without requiring any changes to the mine plan. This allowed material that was previously stockpiled in the 2015 DFS and processed at the end of the mine life to be processed earlier in the mine life. This has the effect of reducing the Life of Mine ('LOM') from 13 years to 10.5 years but increases annual production and improves economics.

2.4.3 Further Upside Potential

KEFI aims to extend the mine life below the 1,400 m level (40 m below the planned base of the open cut) using underground methods. Below this level there is an existing Indicated resource of 1.08 Mt at 5.63 g/t for 200k oz of gold. The underground resource demonstrates the underground mining potential and a Preliminary Economic Assessment ('PEA') is under internal review, with an initial draft prepared by Redden Mining.

3.0 GEOLOGY MINERALISATION AND EXPLORATION

3.1 Introduction

This section has been included for completeness and is as presented in the 2015 DFS. Further details relating to the Geology Mineralisation and Exploration are contained in the 2015 DFS.

The resource estimate was compiled by Snowden Mining Industry Consultants Pty Ltd (Snowden) and KEFI in January 2015 and remains as reported in the 2015 DFS. No additional drilling or mining has been carried out since the completion of the Snowden site visit carried out between 17 July 2014 and 23 July 2014.

3.2 Mineral Resource Estimates

A number of resource estimates have been carried out at Tulu Kapi since 2009 by various consultants with an expanding database including H&S in September 2009, Venmyn in 2010, SRK in 2011 and Wardell Armstrong International ("WAI") in 2012.

The 2012 DFS resource estimate was carried out by WAI using a semi-constrained block model in Datamine using the dynamic anisotropy methodology. This was updated post-acquisition by KEFI in March 2014 in the first update as a means of verifying the WAI methodology and resource estimate. It was also used as a starting point for a small infill drilling program to confirm significant intercepts predicted by the model and for first pass mine planning of the proposed higher grade / reduced throughput operation.

The KEFI March 2014 estimate incorporated significantly more structural control than all previous estimates in the form of closely spaced strike and dip strings on section and in plan defining continuity of mineralisation. These were based on structural measurements and from observations as known and agreed by the geologists experienced with the deposit. The 2014 estimate also used all available data, including 16,000 m drilled by Nyota late in 2012 which missed the cut-off date of the data base (September 2012) used in the 2012 WAI resource estimate. KME also corrected errors in the Nyota / WAI drill database which (along with the missing 16,000 m) had resulted in the underestimation of the Indicated Resource via a lack of downhole survey data being applied to selected drillhole azimuth and dip. The March 2014 estimate was carried out on a 5 x 5 x 1 m block model.

The additional data input by KME (under KEFI) in March 2014 allowed for a 69% increase of the Indicated Resource from 1.1 Moz to 1.86 Moz Au.

The resource estimate was further refined using additional structural data based on surface mapping and trenching plus a small programme of additional reverse circulation targeted at infill drilling and maximising structural interpretation. This work was performed between March and June 2014.

The August 2014, resource update took into account all drilling and trenching conducted to date along with improved understanding of geological and structural controls and was signed-off by Snowden. The estimate was carried out on a 10 x 10 x 1.5 m block model.

In February 2015, KEFI announced the latest JORC compliant independently verified Indicated Resource completed to finalise the basis for the 2015 DFS. As part of the 2015 DFS, the updated Indicated Resource was derived from wireframing all the mineralised structures and has been used as a base for refined pit design, mine scheduling and Ore Reserve estimation.

3.3 Mineral Resource

The classified Mineral Resources for the Tulu Kapi deposit have been reported using a 0.45 g/t Au cut-off grade for a potential open-pit resource above the 1,400 mRL and a 2.5 g/t Au cut-off grade for a potential underground resource below the 1,400 mRL. The elevation limit and cut-off grades are based on open-pit optimisation studies carried out as part of reviews of the previous definitive feasibility study works.

The total Mineral Resource for the Tulu Kapi deposit, as at January 2015, is reported in Table 3.1.

Table 3.1 January 2015 Tulu Kapi Mineral Resource Estimate Reported Above a 0.45g/t Au Cut-off and 2.5g/t Au Cut-off

JORC (2012) Resource Category	Reporting Elevation	Cut-off (g/t Au)	Tonnes (Mt)	Au (g/t)	Ounces (million)
Indicated	Above 1,400 RL	0.45	17.7	2.49	1.42
Inferred	Above 1,400 RL	0.45	1.28	2.05	0.08
Indicated and Inferred	**Above 1,400 RL**	**0.45**	**19.0**	**2.46**	**1.50**
Indicated	Below 1,400 RL	2.50	1.08	5.63	0.20
Inferred	Below 1,400 RL	2.50	0.12	6.25	0.02
Indicated and Inferred	**Below 1,400 RL**	**2.50**	**1.20**	**5.69**	**0.22**
Total Indicated	All		18.8	2.67	1.62
Total Inferred	All		1.40	2.40	0.10
Total Indicated and Inferred	**All**		**20.2**	**2.65**	**1.72**
All numbers are reported to three significant figures. Small discrepancies may occur due to the effects of rounding.					

Additionally, the Total Mineral Resource for Tulu Kapi, as at January 2015, is reported at various cut-offs with no consideration of mining method as outlined in Table 3.2.

Table 3.2 January 2015 Tulu Kapi Mineral Resource Estimate Reported at Various Cut-off Grades

JORC (2012) Resource Category	Cut-off (g/t Au)	Tonnes Mt	Au (g/t)	Ounces (million)
Indicated	0.00	19.6	2.63	1.65
Inferred	0.00	1.60	2.21	0.11
Indicated and Inferred	**0.00**	**21.2**	**2.60**	**1.77**
Indicated	0.20	19.6	2.63	1.65
Inferred	0.20	1.59	2.23	0.11
Indicated and Inferred	**0.20**	**21.2**	**2.60**	**1.77**
Indicated	0.30	19.6	2.63	1.65
Inferred	0.30	1.56	2.26	0.11
Indicated and Inferred	**0.30**	**21.1**	**2.60**	**1.77**
Indicated	0.45	19.5	2.64	1.65
Inferred	0.45	1.52	2.31	0.11
Indicated and Inferred	**0.45**	**21.0**	**2.61**	**1.76**
Indicated	0.50	19.4	2.65	1.65
Inferred	0.50	1.51	2.32	0.11
Indicated and Inferred	**0.50**	**20.9**	**2.62**	**1.76**
Indicated	1.00	16.5	2.97	1.58
Inferred	1.00	1.02	3.05	0.10
Indicated and Inferred	**1.00**	**17.5**	**2.98**	**1.68**
Indicated	2.50	7.10	4.72	1.08
Inferred	2.50	0.47	4.80	0.07
Indicated and Inferred	**2.50**	**7.57**	**4.73**	**1.15**
Indicated	5.00	2.12	7.79	0.53
Inferred	5.00	0.18	6.94	0.04
Indicated and Inferred	**5.00**	**2.30**	**7.72**	**0.57**
All numbers are reported to three significant figures. Small discrepancies may occur due to the effects of rounding.				

As part of the continuing work being carried out for the purpose of better understanding the Tulu Kapi mineralisation a master's thesis is being undertaken by Zsolt Molnar, KEFI Minerals Senior Resource Geologist which involves a detailed study of mineralisation and structure within the Tulu Kapi orebody.

The MSc is likely to be finished and published before mining will commence and has goals, amongst others:

- Refinement of drill targeting / planning for exploration and resource definition / estimate via Tulu Kapi structural studies.

- Refinement of resource grade estimation parameters especially domaining of high grade zones and furthering understanding of the relationship between mineralogy and grade.

3.4 Ore Reserve Estimate

Details relating to the ore reserve estimate can be found in the 2015 DFS.

The ore reserve estimate which was compiled by Snowden remains as reported in the 2015 DFS.

Snowden updated the Ore Reserve based on the February 2015 Mineral Resource estimate. Pit optimisation was carried out by Snowden using Whittle pit optimisation software, staged pit design production scheduling and mine cost modelling.

Snowden's Ore Reserves at April 2015 are estimated using a 0.5 g/t Au cut-off as provided in Table 3.3.

Table 3.3 April 2015 Tulu Kapi Ore Reserve Estimate Reported Above a 0.5 g/t Au Cut-off Grade

JORC (2012) Reserve Category	Cut-off (g/t Au)	Tonnes (Mt)	Au (g/t)	Ounces (Million)
Probable – High grade	0.90	12.0	2.52	0.98
Probable – Low grade	0.50 to 0.90	3.3	0.73	0.08
Total		**15.4**	**2.12**	**1.05**

Note: Mineral Resources are inclusive of Ore Reserves. Numbers are reported to three significant figures. Small discrepancies may occur due to the effects of rounding.

Table 3.4 Competent Person's Assessment of Ore Reserve Estimation for Tulu Kapi Deposit (Table 1 - Section 4 of the JORC Code)

<table>
<tr><th>Item</th><th>Comment</th></tr>
<tr><td>Mineral Resource for conversion to Ore Reserve</td><td>Snowden prepared the updated Tulu Kapi Mineral Resource estimate in February 2015. The relevant part of the Mineral Resource estimate is provided below. No planned dilution was applied to these estimates. Mineral Resources are inclusive of Ore Reserves.
<table>
<tr><th>JORC (2012) Mineral Resource Category</th><th>Reporting Elevation</th><th>Cut-off (g/t Au)</th><th>Tonnes (Mt)</th><th>Au (g/t)</th><th>Ounces (M)</th></tr>
<tr><td>Indicated</td><td>above 1,400 RL</td><td>0.45</td><td>17.7</td><td>2.49</td><td>1.42</td></tr>
</table></td></tr>
<tr><td>Site Visits</td><td>No site visit was undertaken by Mr Blanchfield who is one of the Competent Persons for the Ore Reserve estimate, however Mr Di Giovanni, who is the Competent Person for metallurgy has visited the Tulu Kapi project site as well as Mr John Graindorge, a Snowden resource geologist who visited the Tulu Kapi project site for the purposes of Mineral Resource estimation in July 2014. They have reviewed data and photos with Mr Blanchfield to his satisfaction.</td></tr>
<tr><td>Study Status</td><td>Previous studies:

A definitive feasibility study ("DFS") was completed by the previous owner, Nyota, in 2012
Work was completed by Snowden in August 2014 to update Ore Reserves using an updated Mineral Resource (by Snowden). Snowden considers that most of the 2014 work completed for Ore Reserves estimation was of a pre-feasibility-level accuracy however there were some omissions (that did not affect the materiality of the reserve estimate) that prevented Snowden determining the 2014 reporting as a pre-feasibility study ("PFS") and there was no published pre-feasibility studies for KEFI's Tulu Kapi project.

Current studies:

The Tulu Kapi feasibility study ("FS") is at an advanced stage. Snowden has completed most of the mining studies consistent with the accuracy required for this type of study, however costings are currently at a pre-feasibility level but considered still appropriate for the current April 2015 Ore Reserve. These costings are expected to be validated by fully detailed costs at the
</td></tr>
</table>

Table 3.4 Competent Person's Assessment of Ore Reserve Estimation for Tulu Kapi Deposit (Table 1 - Section 4 of the JORC Code)

Item	*Comment*
	conclusion of the FS.
Cut-off Parameters	*An elevated cut-off grade of 0.9 g/t Au is used for the first 10 years of the project production schedule. Ore at a cut-off of between 0.5 g/t Au and 0.9 g/t Au was stockpiled and then processed in the final three years of the project resulting in a project life of 13 years. The marginal cut-off grade was estimated to be 0.47 g/t Au based on the economic inputs and Modifying Factors outlined in this table. It should be noted that the August 2014 Ore Reserve for Tulu Kapi only reported ore at an elevated cut-off of greater than 0.8 g/t and no low grade ore was included in the 2014 Ore Reserve.*
Mining Factors and Assumptions	*To identify the Tulu Kapi Ore Reserve, a process of Whittle pit optimisation, staged pit design production scheduling and mine cost modelling was undertaken by Snowden.* *The mining method modelled is conventional open pit drill and blast, load and haul on a 7.5 m high blasting bench, reflecting a semi-selective mining approach using 120 t class backhoe configured excavators. No special infrastructure requirements will be required for this mining method.* *Three months of overburden pre-stripping will be required where a small amount of ore is to be stockpiled.* *Planned dilution was applied through modelling a 500 mm vertical block dilution. This reduced the feed ounces by approximately 5% and increased the ore tonnage processed by 9%. An unplanned ore loss of 5% was also applied to the ore inventory.* *Less than 80 kt or 0.6% of the Mineral Resource inside the pit is classified as Inferred. This Inferred resource was considered as diluting grade, and only influenced the grade adjacent in the Indicated Mineral Resource blocks. It is therefore not incorporated into the Ore Reserve.*
Metallurgical Factors and Assumptions	*The mineralisation modelled and metallurgical testwork available indicate that conventional CIL extraction can be used, to produce gold as doré.* *The gold is free milling and all the unit processes included in the plant design are standard and common to many current gold operations.* *The testwork program included:* • *Comminution testwork.* • *Flotation testwork.* • *Cyanidation testwork.* • *Oxygen uptake.* • *Gravity recoverable gold testwork.* • *Thickening testwork.* • *Cyanide detoxification.* *Variability testwork was conducted on samples from different lithologies and different mineralised zones. Samples were selected mainly to define the differences in ore hardness (or grindability) and gold recovery. Samples were taken from 11 geographically diverse oxide mineralised zones for grindability and extraction testwork, 16 samples from spatially diverse fresh mineralised zones for extraction testwork and five samples from spatially diverse fresh mineralised zones for both comminution variability and extraction testwork. There are no deleterious metals identified.* *No bulk sample or pilot scale test work was justified or completed.* *The metallurgical factors were developed by SENET and reviewed by Snowden. Metallurgical recoveries were applied to the Snowden optimisation and Snowden production schedule and KEFI's financial model. The algorithms estimate lower recovery at lower ore grade as used for this Ore Reserve estimate include the following:* • *Oxide ore: 100 x 0.986*((DilAu-(0.0465*DilAu+0.0294))/DilAu), ranging from 88.2% to 96.0% LOM, at an average of 95.6%.* • *Fresh ore: 100 x 0.986*((DilAu-(0.053*DilAu+0.0193))/DilAu), ranging from 85.3% to 94.7% LOM, at an average of 94.0%.* • *Fresh hard ore: 100 x 0.986*((DilAu-(0.0916*DilAu+0.0056))/DilAu), ranging from 69.7% to 95.6% LOM, at an average of 89.6%.* • *The overall LOM recovery was estimated to be 91.5%.*
Environmental	*Rock characterisation studies were completed by Golders. No acid rock drainage ("ARD"), or elevated geothermal temperatures were identified.* *The Mining Licence was approved and issued in April 2015. The Mining Licence allows provision for onsite tailings impoundment and waste rock land forms.* *Final landform waste dumps will be modelled for the DFS.*
Infrastructure	*Detailed discussions were recently held with local power authority (EEPCo) regarding connection to*

Table 3.4 Competent Person's Assessment of Ore Reserve Estimation for Tulu Kapi Deposit (Table 1 - Section 4 of the JORC Code)

Item	*Comment*
	the national electricity grid. Other than utility charges, no other significant operating costs arise for grid connected electrical energy usage. Published tariff data for industrial consumers taking supply at high voltage is used as the basis for the operating cost under this supply option. *Local labour will be sourced from surrounding communities and a camp will be constructed for 250 persons to house expatriate and non-local personnel.*
Cost and Revenue Factors	*Process costs were developed from first principles by SENET, for a new process plant.* *Process costs included the following:* *Item* / *US$/t ore*: *LOM Oxide Ore Processing Costs* — *9.41* *LOM Fresh Ore Processing Costs* — *7.09* *LOM Fresh Hard Ore Processing Costs* — *10.42* *LOM Average Process Operating Costs* — *8.17* *Site G&A* — *5.38* ***Total*** — ***13.55*** • *Pre-feasibility mining costs were developed from first principles by Snowden in 2014 for an all up mining cost of US$2.74 per tonne. This cost was scaled up to US$3.00 per tonne to allow for the costs of semi-selective mining. In June 2015, MACE has confirmed a cost at US$3.06 per tonne* • *Mining capital costs were estimated to be US$23.3M including mobile equipment and fixed mine infrastructure. MACE later updated the mining capital costs to:* – *Capital Development US$15.59M.* – *Capital Equipment US$50.82M.* • *Other capital costs include the following:* – *Process capital costs are US$58.3M.* – *Tailings infrastructure costs US$7.5M.* – *Other infrastructure costs (TSF, roads, power, camp) of US$21.7M.* – *Indirect costs (EPCM and insurance) US$12.6M.* – *Owner's costs of US$8.8M.* – *Sustaining costs of US$43.9M (including Snowden sustaining capital of US$12M).* – *Working capital of US$5.9M.* • *Closure costs were included and estimated to be $8.25M.* • *Refining costs of US$5.77 per ounce (US$8.88 per ounce inclusive of transport) were included.* • *A royalty of 7% were applied to net revenue from sales of gold produced.* • *All costs were supplied in US$.*
Revenue Factors	*A gold price was supplied by KEFI at US$1,250 per ounce. This was applied real and as a flat forward price in the financial model.*
Market Assessment	*In determining the revenue parameters, KEFI conducted comprehensive market studies including discussion with likely refiners.* *A comprehensive marketing study was also completed as part of the Nyota 2012 DFS concluding the refining of the doré. Gold is free trading.*

Table 3.4 Competent Person's Assessment of Ore Reserve Estimation for Tulu Kapi Deposit (Table 1 - Section 4 of the JORC Code)

Item	*Comment*
Economic	*A discount rate of 8% was applied in the KEFI financial model.* *A financial sensitivity study was undertaken evaluating capital expenditure, operating costs and gold price. The project was seen to be most sensitive to changes in gold price, with a 20% reduction in price resulting in a breakeven NPV position, whilst a 20% increase in price approximately doubled the NPV.* *Key project metrics*** (after tax) from the KEFI cash flow model include the following:* *All in cash cost including royalty, excluding salvage costs (US$/oz produced)* 913.0 *IRR ungeared (%)* 22.7 *NPV 8% (US$M)* 102.2 *(US$/oz produced)** 634.0 *Initial capital cost** (US$M)* 132.3 **Excludes royalty and refining costs.* ***Excludes working capital and pre-production funding.* ****Project metrics were re-estimated at the completion of the FS in June 2015 and resulted in marginal changes to the economics with the NPV increasing to US$112M*
Social	*A socio-economic study was prepared by Golder Consultants for Nyota and this is documented in 2012 DFS that was completed by SENET for Nyota. The commentary provides a summary of the socio-economic characteristics of the area at a household level. Nyota conducted a stakeholder engagement program and survey in 2010.* *KEFI has commissioned a community management team and specialist Ethiopian consulting firm Dynamic which, in conjunction with the local government, has facilitated the drafting of the selection and allocation of new host lands, the compensation amounts and the livelihood restoration policy.*
Classification	*The Ore Reserve is classified as Probable in accordance with the JORC Code, corresponding respectively to the Mineral Resource classifications of Indicated. No Inferred Resources are included in the Ore Reserve estimate.*
Audits or Reviews	*Snowden has completed an internal peer review of the Ore Reserve estimate. The KEFI financial model was also reviewed by Endeavour Financial Limited.*
Relative Accuracy / Confidence	*Snowden's opinion of Ore Reserve is that the classification of Probable is reasonable. However lower confidence is attributed to the following Modifying Factors:* • *Dilution: The dilution for the proposed selective mining method was modelled by applying +/- 0.5 m dilution zone to the Mineral Resource model, representing the average mixing of ore and waste expected to occur at the boundary by the excavator. As the mineralised lodes are typically 2 m to 3 m wide, the realised grade will be sensitive to achieving this outcome and can only be confirmed by a production reconciliation process* • *Mining costs: The mining costs are currently at a pre-feasibility level of accuracy; however these will be upgraded to an appropriate level of accuracy for the conclusion of the current FS using OEM and project specific budget quotations from contractors* • *A blasting study should be undertaken for further validation of the dilution assumptions for the proposed mining method.*

4.0 MINING

4.1 Introduction

Subsequent to the 2015 Tulu Kapi Detailed Feasibility Study (DFS) a number of initiatives were undertaken to more accurately reflect the operating potential of the project and introduce both improved cash flows and cost reductions. The following sections describe initiatives undertaken subsequent to the 2015 DFS.

4.2 Basis of Mine Design

4.2.1 Design Parameters

The pit slope and ramp configurations remain unchanged from the DFS. Rationalisation of the pre-mining works has however been undertaken to reduce unnecessary burden on pre-production costs. These changes are described later in this section.

4.2.2 Pre-Mining Construction

Rationalisation of pre-mining works has resulted in a reduction in the initial excavation materials required for project bulk earthworks. Figure 4.1 shows the extent of the earthworks proposed in the DFS and the revised layout is shown in Figure 4.2. The DFS schedule required movement of approximately 1,300,000 bcm. The revised design requires only approximately half of this volume being 610,000 bcm. Plant site layouts and tailings storage facilities were balanced for cut to fill or have the necessary materials within their own footprint.

Figure 4.1 Pre-Mining Works 2015 DFS

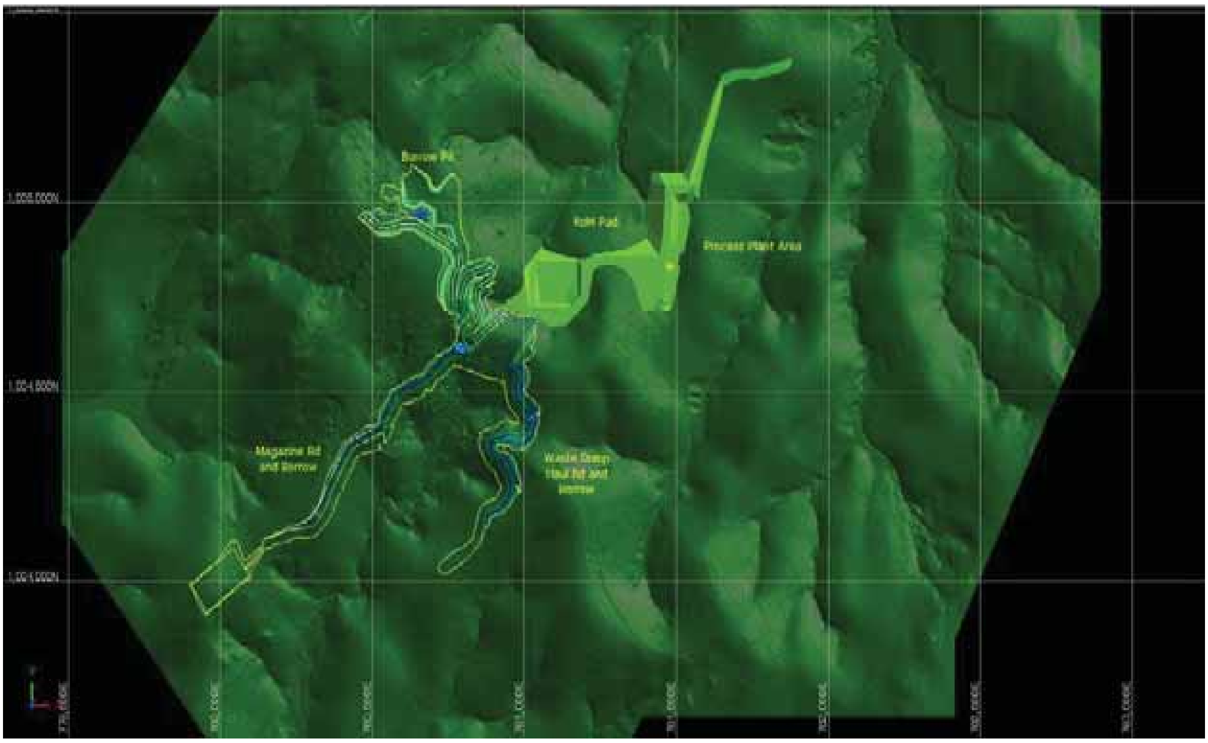


Figure 4.2 Pre-Mining Works Study Update

The pre-mining bulk earthworks required for construction will be undertaken by a separate earthmoving contractor during the construction period. Operations completed in this period will be carried out independently of the mining fleet and will include the following scope:

- Site access road to the process plant site.
- Accommodation village pad.
- Process plant pad and mining contractor laydown area.
- Tailings dam.
- Water Dam and diversion channels.

During construction of the process plant a reinforced earth wall will be constructed for the primary crusher installation. The engineering fill and any necessary bulk fill will be placed by the EPC contractor. The mining contractor will place fill against this material at a later date during the pre-production period.

A mining contractor will undertake the bulk earthworks necessary for the commencement of production from the mine excavation. The pre-production scope of work required by the mining contractor has been substantially reduced owing to the high fixed cost associated with the mining contractor's site overheads. Much of these works will be undertaken by either the bulk earthworks contractors or the EPC contractor.

The pre-production bulk earthworks currently allowed to be undertaken by the mining contractor include the following:

- Initial ROM pad.
- ROM pad haul road from the pit.
- Access track to the explosive magazine.
- Explosive magazine pad.
- Emulsion plant access road and pad.

These works were scheduled to be undertaken in the three month period prior to process plant commissioning. It should be noted that the magazine facility and emulsion plant facility will likely need to be constructed by the bulk earthworks contractor.

4.3 Pit Design and Refinements to Mine Schedule

4.3.1 Re-sequencing Stage 1 Pit Development

Several improvements to the Tulu Kapi DFS mining schedule were investigated by Mining and Cost Engineering Pty Ltd (MACE) to enhance the project cash flow. These included the following:

- Splitting Stage 1 into two sub-stages, Stage 1A and 1B to access higher grade earlier in the project life.
- Vertical advance rates were increased from 45 m/yr or six benches to an average of 58 m/yr or eight benches following discussion with the potential mining contractor.
- Total movement capacity was increased by 6 Mt/yr whilst mining through the semi-barren areas of Stage 2.

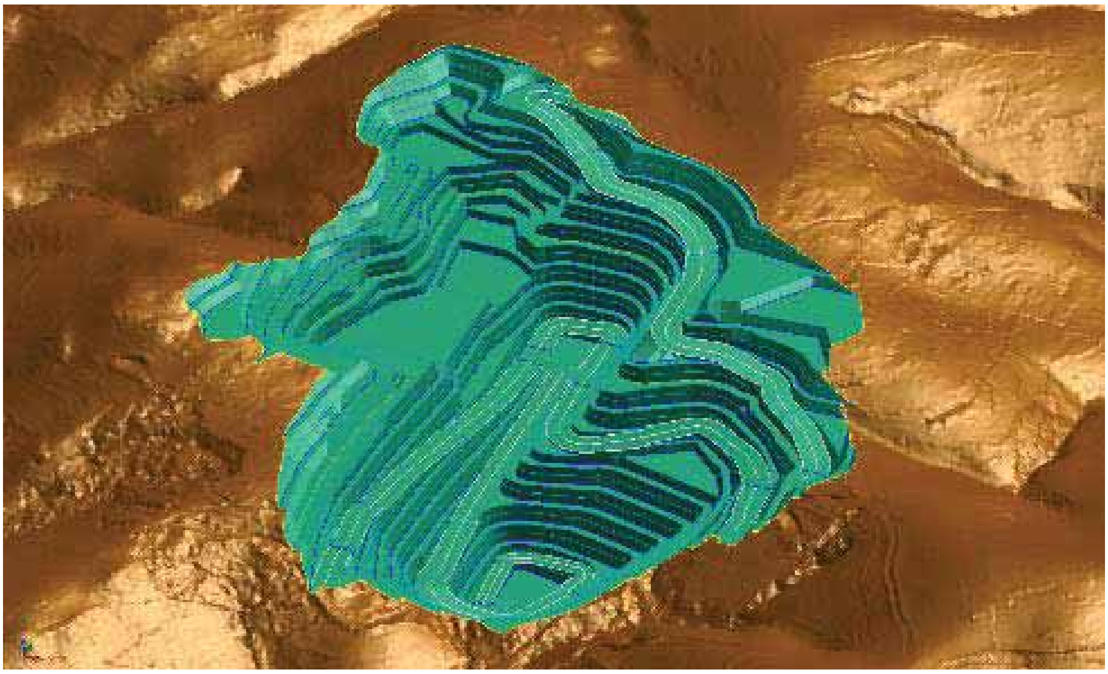
These project improvement initiatives are discussed in more detail in the following section.

Initial Stage Design

The Snowden Stage 1 pit design, as shown in Figure 4.3, was based on DFS shell 12 and reported a processing inventory of 5.0 Mt at 2.40 g/t with a total pit inventory of 38.4 Mt. This is compared to the original shell 12 inventory of 4.40 Mt at 2.47 g/t for a total pit of 26 Mt. This represents a 47% increase in total stage inventory between pit shell and pit design.

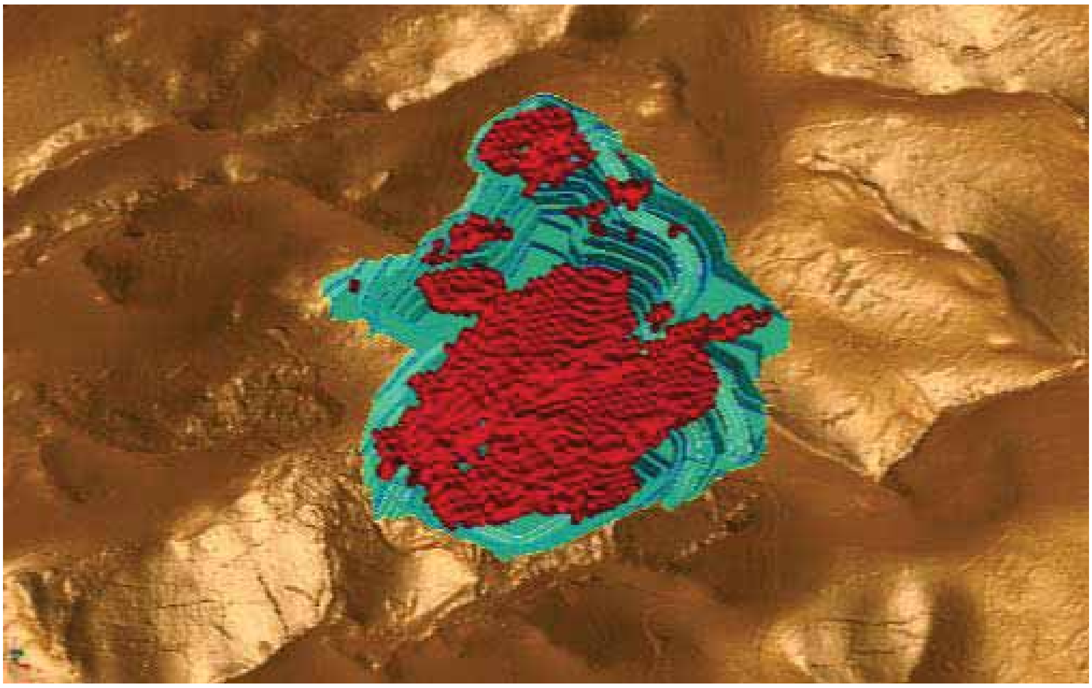
The DFS scheduling of this Stage 1 design showed higher grade material being delayed until Years 2 and 3 due to the majority of the higher grade (>=0.90 g/t) material being contained in the lower benches.

Figure 4.3 Original Stage 1 Design



In reviewing the Whittle shells, opportunities were identified to bring forward higher grade by subdividing the pit stage through the use of DFS pit shell 10. This was used as a guide for a smaller interim Stage 1 design to bring higher grade into Year 1. As shown in Figure 4.4, Whittle shell 10 focussed more on the southern area of Stage 1. In contrast, the DFS mining schedule focused early mining in the northern end of the pit. This was due to the higher elevation and simple bench by bench mining progression of the stage.

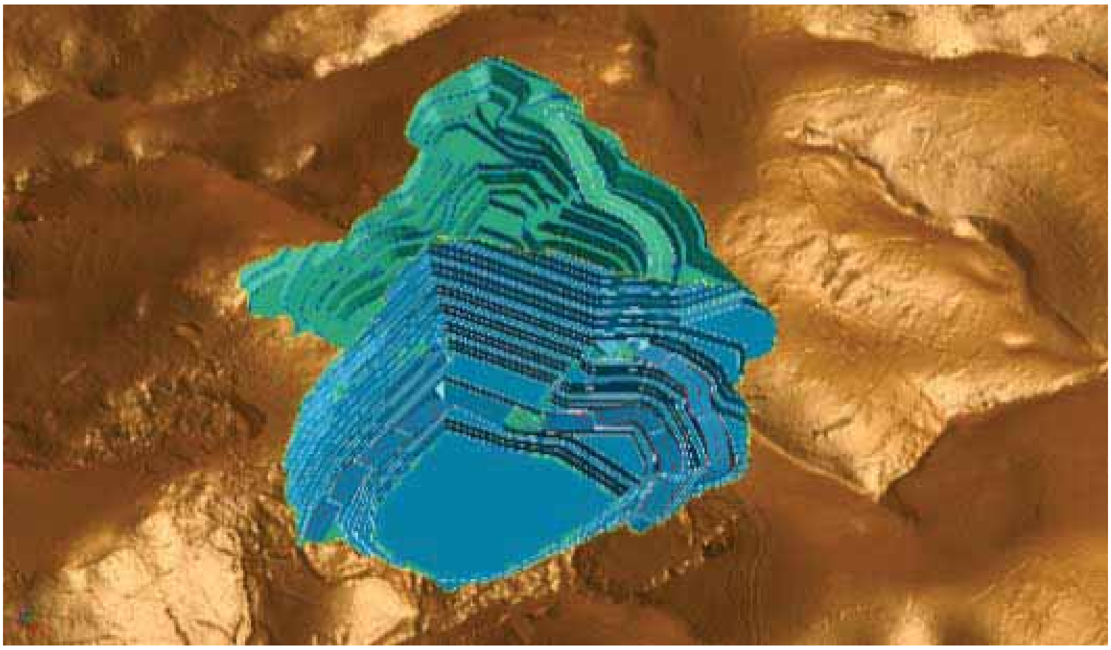
Figure 4.4 Original Stage 1 Design with Whittle Shell 10 (red)



To improve early cash flow the DFS Stage 1 design was subdivided into two sub stages, Stage 1A and 1B as shown in Figure 4.5. The inventory for Stage 1A was estimated to be 2.8 Mt at 2.44 g/t with a total pit inventory (ore and waste) of 19 Mt. The inventory of Stage 1B was estimated to be 2.5 Mt at 2.33 g/t with total pit inventory of 20 Mt.

Using this pit configuration, the mining strategy proposes to mine Stage 1A initially and delay Stage 1B until Month 9 (Qtr 2). This strategy was modelled using Minesched software and resulted in the average grade processed in Year 1 increasing to 2.5 g/t, compared to the DFS Year 1 average grade processed of 1.9 g/t.

Figure 4.5 Original Stage 1 Design (green) with Stage 1A (blue).



This strategy also provides an additional benefit in that initial mining is away from the existing exploration camp facility (circa 100 m), located at the top of the ridge. Whilst the camp will require clearing during blasting, it could potentially be used for some purpose up until Month 7 when mining commences in Stage 1B.

Vertical Advance Rate

The original schedule was constrained by a vertical advance rate (VAR) of 45 m/yr or 6 benches. Following discussion on this issue with the preferred mining contractor the VAR was increased to the figures shown in Table 4.1.

Table 4.1 Stages Vertical Advance

	To Complete		Vertical Advance Rate		
Phase	Months	Benches	m	Ave m/mon	Ave m/yr
Stage 1A	25	17	128	5.1	61
Stage 1B	38	27	203	5.3	64
Stage2	53	33	248	4.7	56
Stage 3a	29	17	128	4.4	53
Stage 3b	9	8	60	6.7	80
Stage 3	52	31	233	4.5	54

It should be noted that Stage 3b has a significantly higher VAR; however this was considered achievable due to the stage having smaller bench ore inventories and therefore consists of mostly bulk waste material which is mineable at a faster rate.

Mill Throughput Increase

The original schedule was based on a 1.2 Mtpa throughput. This resulted in high grade stockpiles growing to greater than 1.5 Mt and low grade stockpiles reaching more than 3.0 Mt. The higher throughput rate process plant design is expected to realise an increase in plant throughput to 1.50 Mtpa. This re-configured plant design would also allow an increase to 1.70 Mtpa when processing softer ores in the early years of production.

Following a detailed analysis of the distribution and presentation of ore hardness within the mining sequence the following mill throughput rates were applied in the mining schedule:

- Year 1: 1.43 Mt (ramp up during commissioning in 1st qtr of Year 1).
- Year 2 to 4: 1.70 Mt per year.
- Year 5 onwards: 1.50 Mt per year.

A comparison of the updated mining and processing schedule to the original DFS schedule is shown in Figure 4.6, Figure 4.7 and Figure 4.8. The updated schedule reduced high grade stockpile levels to a maximum of 500,000 t whilst low grade remained at inventories of circa 3.0 Mt and will still be processed in the closing stages of the project.

Figure 4.6 Comparison Between Snowden DFS to Updated Schedule of Throughput Tonnes

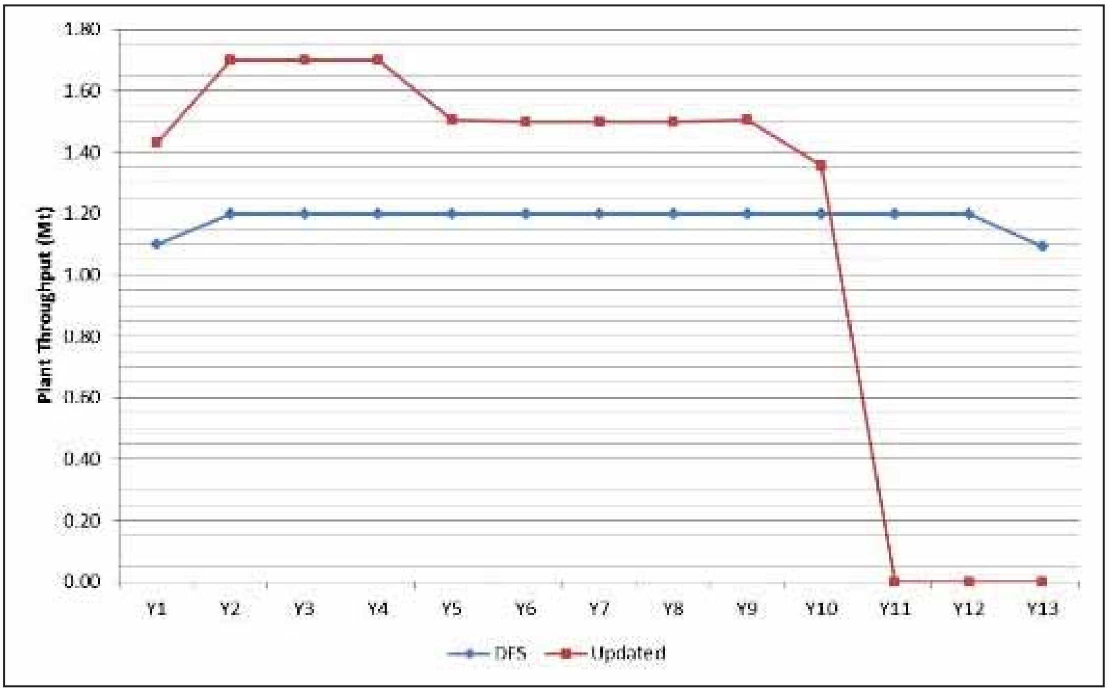


Figure 4.7 Comparison Between Snowden DFS to Updated Schedule of Throughput Grade

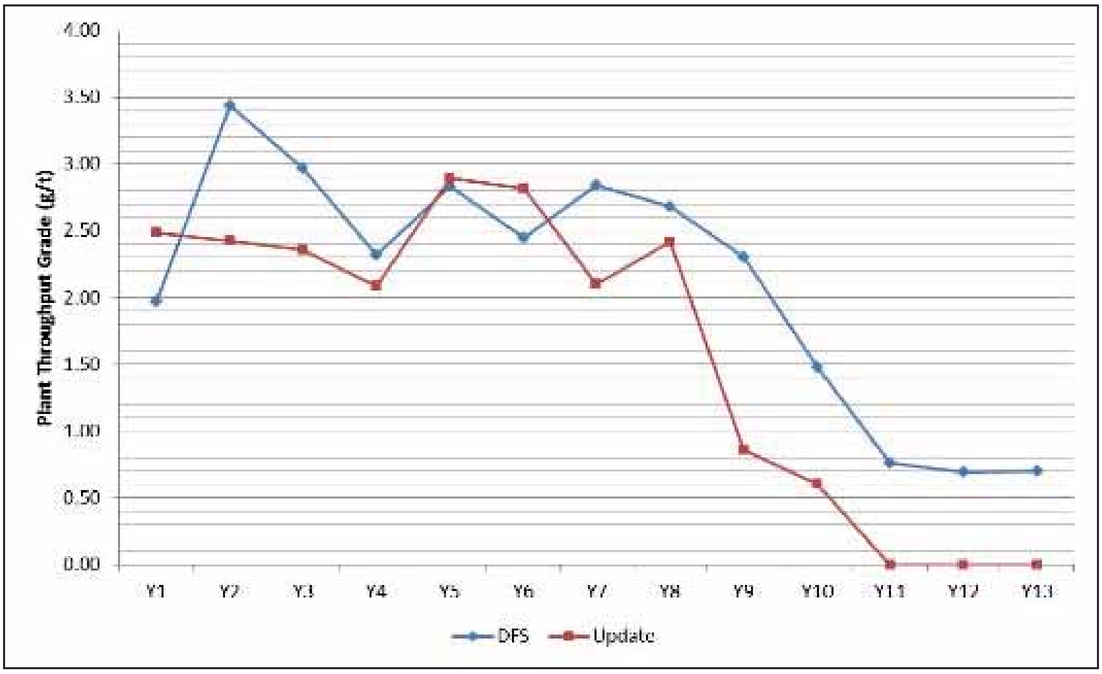
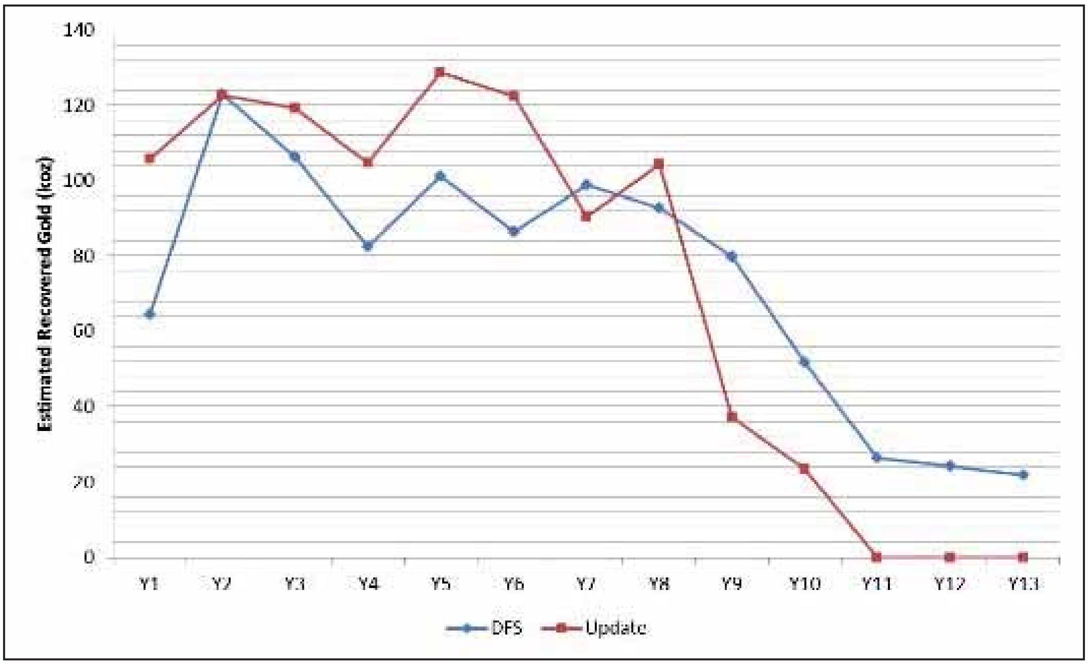


Figure 4.8 Comparison Between Snowden DFS to Updated Schedule of Recovered Ounces[1]

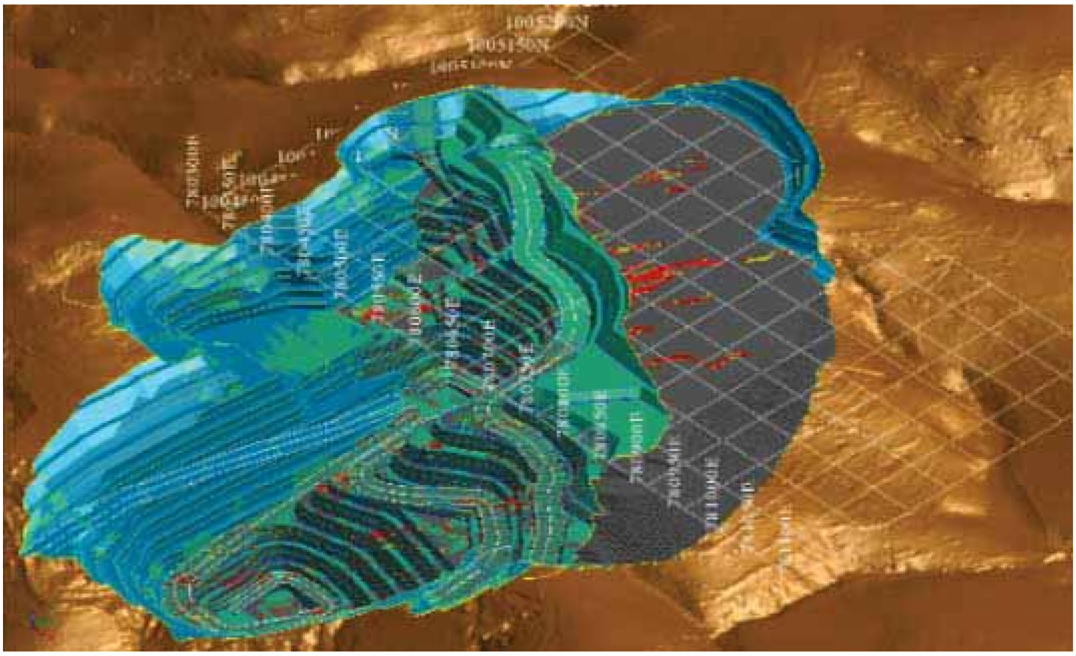


Notes: 1. Using DFS recovery algorithms.

4.3.2 Increased Mining Rate

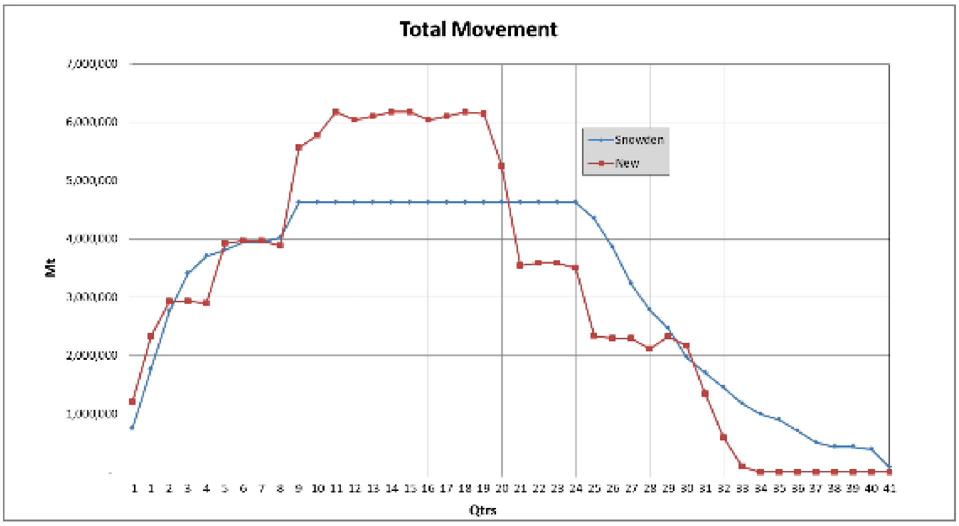
Stage 2 will be the largest stage in terms of the total 54 Mt of material to be mined. It contains nearly twice the inventory of the other stages. With the mining rate capped at 18.5 Mt per year in the DFS, the higher grade ore production rate fell and subsequently the grade available to the plant decreased in some quarters to around 2.0 g/t. The original VAR through Stage 2 was, on average, 3.58 m per month which would be less than half a bench per month. In addition, the Stage 2 benches dimensions are in the vicinity of 250 m wide and approximately 600 m long and contain substantially less mineralisation compared to other areas of the pit as shown in Figure 4.9. It was therefore deemed feasible to increase the mining rate in Stage 2 once the smaller upper benches were complete. Total movement was therefore increased from 18.5 Mtpa to 24.5 Mtpa from Qtr 8 and later reduced in Qtr 20 as shown in Figure 4.10. This increase resulted in improved grades being presented to the process plant and at the same time reducing the life of mine by 6 to 7 quarters resulting in savings in contractor fixed cost charges.

Figure 4.9 Stage 2 Dimensions (dark) Showing Ore and Waste on 1,715 mRL Bench



This strategy would require the addition to the mining fleet of a 120 t excavator with an annual capacity of 6.0 Mt. Following discussions with the preferred mining contractor, it was understood that this machine would already be on site, having been mobilised for construction and early stage mining and then subsequently retained on site for miscellaneous work; hence this increase in mining rate would only require an increase in utilisation of the existing 120 t excavator. Additional trucks will also be required to cater for the increased movement. To account for this, a commensurate increase in truck fleet of four additional trucks was allowed for in the mining costs bringing the total fleet on site to 18 trucks.

Figure 4.10 Total Movement Comparison



4.4 Revised Mining Schedule

The results of the revised mine production schedule are shown in the following tables. The mining schedule is summarised in Table 4.2, the stockpiling schedule is summarised in Table 4.3 and the processing schedule summarised in Table 4.4 and the mining quarterly advance is presented graphically as annexure in Section 5 of the 2015 DFS report.

Table 4.2 Tulu Kapi Mining Schedule

Mining		Period (year)										
	Total	-1	1	2	3	4	5	6	7	8	9	10
Total movement (kt) - Stage 1A	18,573	1,203	9,312	8,058								
Total movement (kt) - Stage 1B	20,090		1,791	6,978	8,779	2,542						
Total movement (kt) - Stage 2	54,076			695	14,781	17,767	14,912	5,832	89			
Total movement (kt) - Stage 3	35,937					4,191	8,769	8,385	8,939	5,560	93	
Total movement (kt) - Stage 4	899								22	877		
Total movement (kt)	129,575	1,203	11,103	15,731	23,560	24,500	23,681	14,217	9,050	6,437	93	
Waste (kt)	114,214	991	9,240	13,166	21,265	22,825	21,404	12,251	7,688	5,309	76	
Total ore (kt)	15,361	213	1,863	2,565	2,295	1,675	2,277	1,966	1,363	1,128	16	
- Grade – Au (g/t)	2.12	1.45	2.01	1.88	1.93	2.01	2.19	2.33	2.13	2.93	10.17	
Saprolite (kt)	914	186	368	213	65	1	14		0	68		
- Grade – Au (g/t)	1.55	1.49	1.62	1.56	1.64	0.75	1.24		1.03	1.29		
Fresh (kt)	10,081	27	1,495	2,353	2,230	1,501	1,831	529	1	113		
- Grade – Au (g/t)	1.99	1.22	2.10	1.91	1.94	1.90	2.19	2.07	1.11	1.31		
Hard (kt)	4,366					172	432	1,437	1,361	947	16	
- Grade – Au (g/t)	2.54					2.91	2.24	2.42	2.13	3.24	10.17	

Table 4.3 Tulu Kapi Stockpiling Schedule

Stockpile	Max	Period (year)										
		-1	1	2	3	4	5	6	7	8	9	10
HG Stockpile												
Addition												
Total (kt)	1,954	147	1,482	1,954	1,741	1,260	1,779	1,579	1,100	962	16	
- Grade – Au (g/t)	2.25	1.79	2.34	2.25	2.32	2.44	2.61	2.73	2.47	3.31	10.19	
Reclaim												
Total (kt)	1,700		1,430	1,700	1,700	1,700	1,504	1,500	1,500	998	16	
- Grade – Au (g/t)	2.43		2.49	2.43	2.36	2.08	2.89	2.82	2.10	3.23	10.19	
Size												
Total (kt)	520	174	225	479	520	81	356	435	35			
- Grade – Au (g/t)	1.07	1.87	1.07	1.07	1.07	1.07	1.07	1.07	1.07			
LG Stockpile												
Addition												
Total (kt)	612	66	381	612	553	415	498	387	263	166	0	
- Grade – Au (g/t)	0.69	0.69	0.70	0.69	0.70	0.70	0.70	0.69	0.70	0.70	0.78	
Reclaim												
Total (kt)	1,488									502	1,488	1,356
- Grade – Au (g/t)	0.75									0.80	0.75	0.60
Size												
Total (kt)	3,180	73	454	1,065	1,619	2,033	2,531	2,918	3,180	2,844	1,356	
- Grade – Au (g/t)	0.70	0.69	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.68	0.60	

Table 4.4 Tulu Kapi Processing Schedule

Processing	Total	Period (year)										
		-1	1	2	3	4	5	6	7	8	9	10
Saprolite (kt)	948		350	140	79	44	6	2	3	90	122	113
- Grade – Au (g/t)	1.56		2.14	1.99	1.62	1.07	1.68	1.09	1.11	1.19	0.75	0.60
Fresh (kt)	10,081		1,080	1,560	1,621	1,512	1,219	458	232	436	1,026	936
- Grade – Au (g/t)	1.99		2.60	2.46	2.39	1.99	2.87	2.34	1.07	0.94	0.75	0.60
Hard (kt)	4,366					144	279	1,040	1,266	974	356	307
- Grade – Au (g/t)	2.54					3.34	3.03	3.03	2.29	3.19	1.18	0.60
Total (kt)	15,394		1,430	1,700	1,700	1,700	1,504	1,500	1,500	1,500	1,504	1,356
- Grade – Au (g/t)	2.12		2.49	2.43	2.36	2.08	2.89	2.82	2.10	2.42	0.86	0.60
Metal												
Feed - Au (koz)	1,050		114	133	129	114	140	136	101	117	41	26
Recovered - Au (koz)	980		108	124	119	105	134	128	93	111	36	22

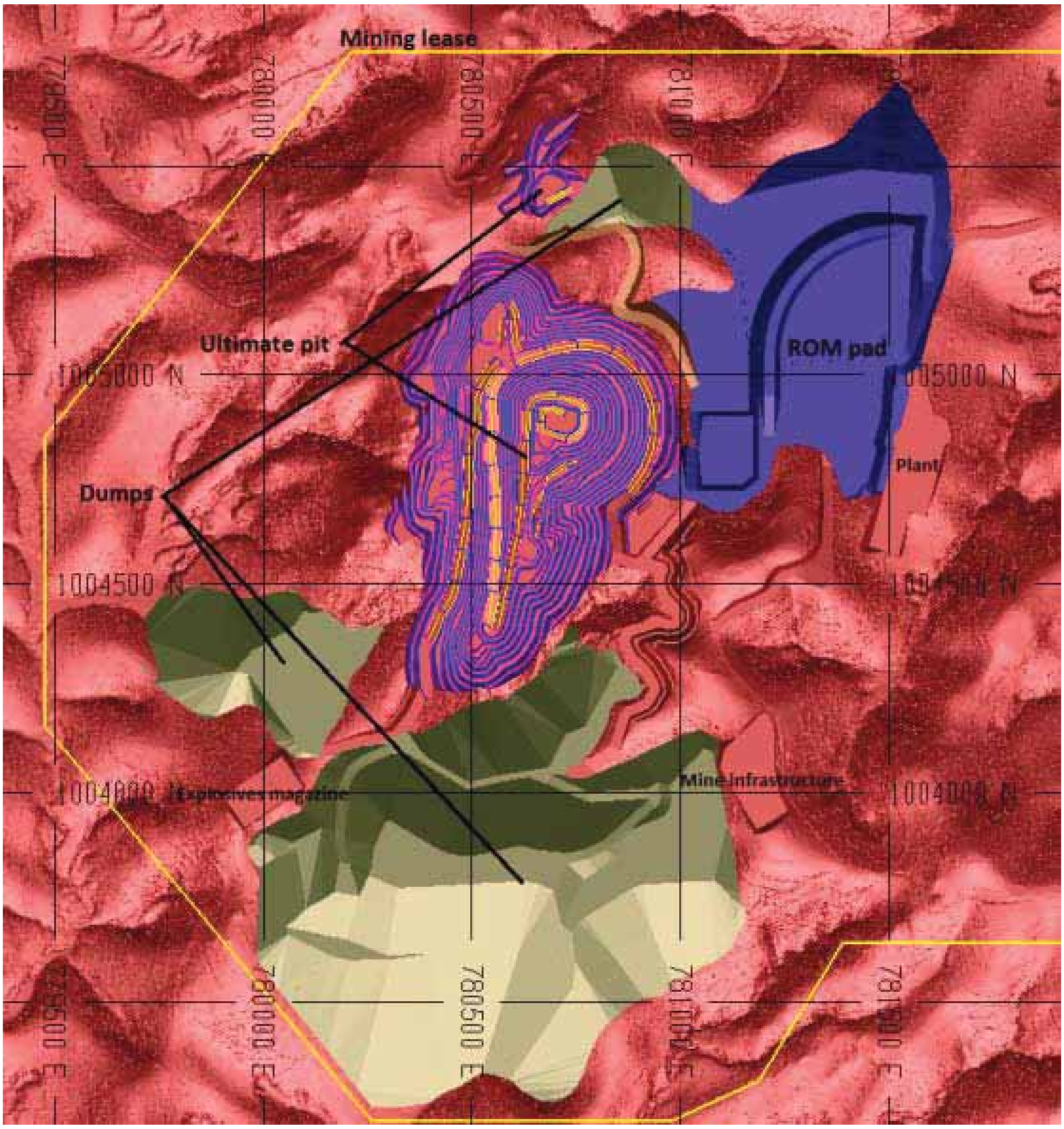
4.5 Waste Dump Design

4.5.1 Overall Layout

For the 2015 DFS waste dump designs were included to the south of the pit and to the west. The waste dump to the north forms the ROM pad with some extension required when mining Stage 4. Figure 4.11 shows the final mining surface at the completion of the stockpile reclaim, with waste dumps, ROM pad and the ultimate pit with other non-mine infrastructure items labelled.

The waste dump designs remain as established in the 2015 DFS and details on the designs are given in the 2015 DFS.

Figure 4.11 Final Surface at Completion of Mining Operations



4.5.2 Risks and Opportunities

During the study update, a number of risks and opportunities were identified which were not explored due to time constraints.

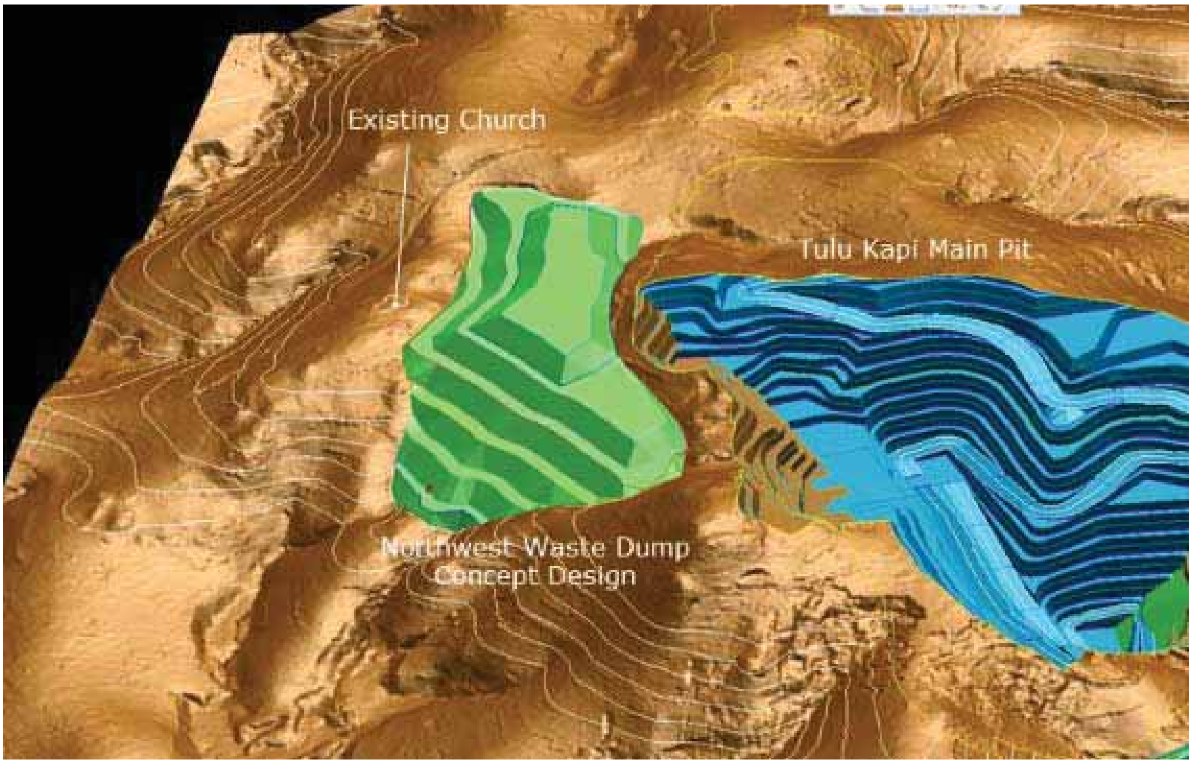
Waste Dumping and Haulage Optimisation

Following discussions with the preferred contractor it was agreed that significant cost savings could be achieved by optimising the haul routes and dump locations. Significantly shorter hauls could be achieved on benches which 'daylight' on the existing topography, especially in the northern areas of the pit. Temporary haul roads could be established to shorten the haul to these dump locations.

Northwest Waste Dump

Valleys adjacent to the pit in the northwest area could be used as short haul dumping locations resulting in cost reductions. A preliminary concept design for this facility is shown in Figure 4.12.

Figure 4.12 Northwest Waste Dump Concept



ROM Pad Configuration Optimisation

The crusher location proposed in the FEED design is 250 m closer to the pit exit than that proposed in the DFS. In addition, the reduced high grade stockpile capacities will not require a ROM pad storage area of the size proposed in the DFS. The ROM pad layout can therefore be further optimised to reduce any unnecessary haul.

Waste Dump Stability Assessments

The waste dump stability assessments carried out in the DFS used the parameters derived from the site investigation of the northern dump area (i.e. ROM pad location). The analysis assumed the base of dump geotechnical conditions would be similar for the southern and south-western dumps. Geotechnical assessments of the actual site conditions should be undertaken before these and any other dump locations are approved for construction.

The assessment should also include potential to maximise end tipping construction rather than lift by lift construction. This will enable haul routes to be reduced with commensurate cost reductions.

These investigations have been budgeted for in the Initial CAPEX.

Open Pit to Underground Transition Study

An open pit to underground transition study should be undertaken to evaluate the most commercially efficient method of extracting economic mineralisation. If it is demonstrated that the depth of the pit should be reduced due to the lower benches being more economical to mine from underground, the pit optimisation should be rerun to identify any potential to reduce the open pit mining envelope and thereby reduce the amount for waste movement.

4.6 Mining Methods

4.6.1 Mining Techniques

The quality and quantity of ore delivered to the processing plant and the minimisation of ore dilution and ore loss are the main aims.

Blasts will be designed by KME’s technical department and implemented by the Contractor to achieve the desired fragmentation and digability whilst minimising the disturbance to ore blocks and damage to final pit walls. Procedures will be established to enable the technical department to conduct a final review and make improvements as necessary on the blast designs prior to drilling commencing.

Following bench establishment, mining will continue to limits predetermined by the technical department. Ore, including both high grade and low grade ore, and waste, including selective waste and bulk waste, will be identified by the technical department. Excavation levels will be controlled by the use of the Contractor’s laser levelling system.

High grade ore, low grade ore and selective waste blocks will be marked out by the technical department on each bench with colour coded markers.

The contractor will excavate high grade ore, low grade ore, selective waste and bulk waste as directed by the technical department using appropriate equipment.

Pit walls will be formed and excavated at angles designated by the technical department. Mining will generally be carried out by excavating high grade ore, low grade ore, selective waste and bulk waste separately. However, concurrent mining may be required from time to time. The contractor will implement methods and practices approved by the owner that will ensure correct identification, excavation and delivery of each material to its design tipping point.

Selective Mining Technique

Within the mining cycle there will be a specific requirement for excavator cleaning and re-handling of waste material to ensure mining selectivity. It is envisaged that mining will progress across the bench from hanging wall to footwall when possible to avoid collapsing ore into the waste zones. The selective mining process will contain seven steps:

1) Bulk waste removal.

2) Cleaning waste from the hanging wall contact.

3) Re-handling of selective waste.

4) Removal of bulk ore.

5) Cleaning of selective ore to the footwall contact.

6) Re-handling of select ore.

7) Continue mining the waste material.

Bottom Loading of Trucks

The cycle will utilise top loading of trucks where practicable. However, the excavator will utilise bottom loading in a number of situations or as directed by the technical department:

- Removing waste less than 1 m thick from the ore on the hanging wall contact of the lode.

- Moving final ore from waste on the footwall contact of the lode or when the ore is less than 1 m thick.

- When re-handling stockpiles of material created from the above two activities.

For ore lodes greater than 2 m wide, the excavator will be able to resume top loading activities. Based on the data contained in the latest schedule, currently 5% of the total material movement is categorized as selective ore and waste mining.

4.6.2 Drill and Blast

Increase of Blast Hole Diameter to 127 mm from 114 mm

Following collaborative discussions with the preferred mining contractor, it was agreed that the proposed blast hole diameter should be increased from 114 mm to 127 mm with a commensurate increase in pattern size. This assessment was made in conjunction with a fragmentation analysis conducted by Itasca and is discussed in the next section.

This change offered certain commercial advantages:

- More cost efficient drilling per unit of hole volume and per bcm.
- Reduction in the unit cost per bcm of initiating explosives.

These costs represent 50% of the cost of a standard blast hole. An example of the comparative saving is shown in Table 4.5.

The DFS also allowed for RC grade control holes to be drilled within the pattern for use as blast holes. This strategy was intended to reduce the cost for drill and blast by reusing the hole; however, the increase in blast hole diameter does not allow for the RC drilling to be used in this manner. The optimised scenario therefore proposes the use of in-pit RC. Costs allow for patterns to be drilled on a 10 m by 10 m grid to a depth of 30 m (four benches). This significantly reduces the RC drill metres required and associated costs.

Table 4.5 Comparison Cost of 114 mm and 127 mm Diameter Blast Holes

Description	Units	DFS	2017 Opt
Diameter	mm	114	127
Bench	m	7.5	7.5
Subdrill	m	0.75	0.75
Drill depth	m	8.3	8.3
Stemming	m	2.3	2.5
Charge length	m	6.0	5.8
Unit charge weight	kg/m	12.4	15.3
Charge weight per hole	kg/hole	73.5	88.1
Powder Factor	kg/bcm	0.49	0.49
Yield	bcm/hole	150	180
Unit cost of drilling	m	$12.71	$13.18
Unit cost of charging	hole	$23.18	$23.18
Emulsion cost	t	$1,796.09	$1,796.09
Cost of drilling	$/hole	$104.86	$108.74
Cost of charging	$/hole	$23.18	$23.18
Cost of emulsion	$/hole	$131.99	$158.30
Total cost of hole	$/hole	$260.02	$290.21
Cost per bcm	**$/bcm**	**$1.73**	**$1.61**
Commercial Benefit		**0%**	**-7%**

Fragmentation Analysis Using 127 mm Diameter Blast Holes

A more detailed assessment of the powder factor for the fresh rock in the pit was carried out to investigate opportunities to reduce costs through a reduction in powder factor without compromising project efficiencies or ore recovery. This was achieved by assessing the fracture frequency distribution within the main pit excavation to interpret the likely “mean block size”, a key parameter used in the Itasca fragmentation analysis.

Fracture frequency (FF) was estimated into the block model by the KEFI geologists using the ‘nearest neighbour’ technique. The distribution of the FF was then reported and is given in Table 4.6. This distribution was then assessed in the context of the block size estimates provided by Itasca and given in Table 4.7. This table summarises the estimated average block diameter (Db) for each rock type based on mean (P_{50}), P_{20}, and P_{80} sizes using discontinuity spacing summarised by Snowden (2015). Db values ranged from 0.17 m to 0.99 m for the Syenite and Eastern Diorite rock types.

Table 4.6 Fracture Frequency Distribution Estimated within Main Pit

FF Cut-off n/m	Vol M.bcm	Cum Vol M.bcm	% Total
0.0	2.0	40.7	100%
1.0	3.3	38.7	95%
2.0	4.4	35.4	87%
3.0	4.6	31.1	76%
4.0	5.6	26.5	65%
5.0	5.0	20.9	51%
6.0	3.9	15.9	39%
7.0	3.0	12.0	29%
9.0	2.0	9.0	22%
10.0	6.2	7.0	17%
20.0	0.6	0.7	2%
30.0	0.1	0.2	0%
40.0	0.0	0.1	0%
50.0	0.0	0.1	0%
60.0	0.0	0.1	0%
70.0	0.0	0.1	0%
80.0	0.0	0.0	0%
90.0	0.0	0.0	0%
100.0	0.0	0.0	0%

Table 4.7 Estimated Average In Situ Block Size for Each Rock Type

	Rock Type	Spacing (m)	Mean FF (ff/m)	J_v (joints/m^3)	V_b (m^3)	D_b (m)
Mean	Syenite	0.18	5.56	11.11	0.03	0.30
	Eastern Diorite	0.28	3.57	7.14	0.10	0.46
P20	Syenite	0.10	10.00	20.00	0.01	0.17
	Eastern Diorite	0.12	8.33	16.67	0.01	0.20
P80	Syenite	0.33	3.03	6.06	0.16	0.54
	Eastern Diorite	0.60	1.67	3.33	0.97	0.99

Notes:

1. β assumed to be 36, which corresponds to a ‘common block shape’ as described Palmstrom (1995)
2. Jv =volumetric joint count
3. Vb = block volume
4. Db = block diameter
5. Based on relationships proposed by Palmstrom (2001).

It can be seen from the distribution of FF in Table 4.4 that a large portion of the pit volume is expected to comprise material with a FF of greater than 5.0 which was interpreted from Table 4.5 to represent an average in situ block size of 0.3 m or less. This volume of material has a weighted average FF of circa 10. The remaining more competent material within the pit was estimated to have weighted average of 2.9.

These values suggest that circa 50% of the pit volume would be drilled and blasted with a mean block size of 0.3 m and the balance 0.5 m. The Itasca fragmentation estimates for 127 mm dia holes were then used to determine an average powder factor for bulk waste and a separate powder factor for ore, selective ore and selective waste.

In addition, following discussion with the preferred mining contractor it was agreed that the bulk waste size distribution could be relaxed to at least 98% passing 750 mm whereas the ore fragmentation would remain at 98% passing 600 mm (the aperture of the ROM bin grizzly). The resultant blasting parameters are given in Table 4.8.

Table 4.8 Drill and Blast Parameters Applied To Fresh Rock in 2015 Optimisation

Classification		**Ore/Select Waste**	**Ore/Select Waste**	**Bulk Waste**	**Bulk Waste**
Material Type	**Units**	**Fresh FF<5**	**Fresh FF>5**	**Fresh FF<5**	**Fresh FF>5**
		Snowden P_{80} Syenite	**SRK P_{50} Syenite**	**Snowden P_{80} Syenite**	**SRK P_{50} Syenite**
Material Density	t/bcm	2.74	2.74	2.8	2.8
Hole Diameter	mm	127	127	127	127
Bench Height	m	7.5	7.5	7.5	7.5
Subdrill	m	0.75	0.75	0.75	0.75
Fall Back	m	0	0	0	0.3
Stemming	m	2.5	2.5	2.5	2.5
Product Density	g/cc	1.2	1.2	1.2	1.2
Powder Factor	kg/bcm	0.74	0.67	0.58	0.5
Powder Factor	kg/t	0.27	0.24	0.21	0.18
Hole Depth		8.25	8.25	8.25	8.25
Stemming Density	t/m^3	2.1	2.1	2.1	2.1
Spillage Factor		0.1	0.1	0.1	0.1
Mass of Stemming per Hole	kg	73.16	73.16	73.16	73.16
Unit Charge Weight	kg/m	15.20	15.20	15.20	15.20
Charge Weight per Hole	kg/hole	87.41	87.41	87.41	87.41
Yield	bcm/hole	118.12	130.46	150.70	174.81
Yield	t/hole	323.64	357.46	421.97	489.48
Blast Hole Factor	holes/t	0.00	0.00	0.00	0.00
B:S Ratio	ratio	1.15	1.15	1.15	1.15
Burden	m	3.69	3.88	4.17	4.49
Spacing	m	4.26	4.48	4.82	5.19
Provision for face hole inefficiency		0.02	0.02	0.02	0.02
Specific drilling	bcm/m.drill	14.04	15.50	17.91	20.05
Proportion of blasts		50%	50%	50%	50%
Average Specific Drill Factor		**14.8**		**19.0**	

In addition to the above changes to the drill and blast parameters for fresh rock, the original provisions for blasting of the saprolite material were revised following discussion with the preferred mining contractor. On inspection of core photos it was agreed that much of the material could be freely dug or easily dug with light blasting. As a consequence, the powder factors allowed for saprolite were revised down from 0.35 kg/bcm to a nominal 0.25 kg/bcm for ore and select waste and 0.2 kg/bcm for bulk waste.

Definition of Material to be Mined

The Tulu Kapi open pit, below the surface soil layer (circa 0.3 m depth from surface), is broadly divided into two weathering zones, being weathered and fresh. The transition zone between the two ranges is expected to range from less than a metre thick to several metres within the pit excavation footprint.

Weathered Material Classification

The weathered material will be a saprolite. Saprolite is typically described as a soft, thoroughly decomposed and porous rock, often rich in clay, formed by the in-place chemical weathering of igneous, metamorphic, or sedimentary rocks. The Tulu Kapi saprolite will mostly be weathered syenite and vary in colour from red - brown to yellow - brown depending on the degree of weathering and oxidised iron content which mostly determines the colouring. The primary minerals in the saprolite are plagioclase feldspar, K-feldspar, quartz and hornblende; the common secondary minerals are goethite, kaolinite, sericite and chlorite. Generally it is soft, friable and breakable by hand or easily hammered apart by hand depending on the degree of weathering and relative depth below surface.

Weathered material will include Residual Soil and Weathered Rock.

The Residual Soil will occur to a depth of approximately 1 m to 3 m below natural surface and have the strength properties of an engineering soil, with an UCS less than 1 MPa; hence, it will have a Point Load Index (Is50) of less than 0.05 MPa. This material is classified as ‘Free Digging’ or where excavation can possibly be aided by light ripping in any laterite capping horizons.

The Residual Soil will occur to a depth of approximately 10 m to 40 m below natural surface and the weathered rock materials will have estimated compressive strengths in the ranges of 1 to 20 MPa, equivalent to Is50 values of approximately 0.05 to 1 MPa, with a typical fracture spacing of 0.05 m to 0.25 m. This material may be excavated by ripping with large dozers (D9 or bigger), possibly aided by light paddock blasting in the deeper, less weathered sections

Fresh Material Classification

The ‘Fresh Material’ will include rocks such as syenite, albitised syenite, diorite and sheared diorite.

Fresh rock will have compressive strengths in the ranges of 50 to >200 MPa, equivalent to Is50 values of approximately 2.5 to >10 MPa, with a typical fracture spacing of 0.1 m to 0.6 m. The weaker range of these rocks may be broken by ripping with large dozers (D9 or bigger), but in practice can only be excavated efficiently by conventional drill and blast methods.

4.7 Contract Mining Strategy

A tender process was initiated in July 2015 with a number of tenderers invited to submit non-binding budget pricing for the DFS scope of work. KEFI provided an undertaking to the tenderers that a contract would be awarded to the preferred tenderer based on the following:

- Successful negotiation of terms and conditions.
- Contractor successfully completing due diligence on in-country operating environment, project risk and KEFI corporate risk.
- KEFI securing project funding.

The tenderers visited the Tulu Kapi site on 23 July 2015 prior to submitting pricing.

A number of rounds of pricing were initiated. The final pricing scenario was based on a life-of-mine scope of work and issued to a short list of three remaining contractors. Tender submissions were evaluated primarily on a commercial basis. Following further negotiation, the preferred tender was selected from two remaining candidates. The final determination was based on a number of non-commercial factors such as technical capability, operational experience and the ability of the contractor to introduce established systems to the project.

It should be noted that the project is exempt from import duties and related taxes during the construction period and up to the first three months of production. Contract pricing has not allowed for any burdens associated with the import of plant and/or materials associated with the project.

4.7.1 Contract Scope Optimisation

The unit rates that underpinned the preferred contractor pricing were used in this phase of project optimisation in this Study Update.

Subsequent to identifying the preferred contractor, collaborative discussions and workshops were held to identify opportunities to optimise the mining approach and scope of the contract to reduce overall mining cost and improve project cash flows. The key opportunities identified included the following:

- Increasing blast hole diameter from 114 mm to 127 mm.
- Detailed assessment of project powder factors.
- Accelerated mining of Stage 2 cut-back.
- Re-sequencing Stage 1 pit development.
- Reduction in preproduction scope of work.
- Optimise waste haulage and dumping locations.

4.7.2 Scope of Services Summary

The scope of services to be undertaken by the Contractor includes the following:

- Construction earthworks.
- Pre-production and mine establishment.
- RC Grade Control drilling and sample collection.
- Drilling and blasting of ore and waste.
- Dewatering of mining areas.
- Ore and waste mining.
- Ore re-handle from ROM stockpiles.
- Waste dump and other site rehabilitation works.

The Contract excludes.

- Sample collection, sample assay, assessment and grade control interpretation.
- Site security.
- Supply and delivery of explosives and accessories to the Site.
- Supply of emulsion explosive into the blast hole.
- Supply of diesel fuel for mining. Diesel fuel will be supplied free of charge to the Contractor and only available from the Principal's onsite bulk fuel storage facility.
- Supply of diesel fuel for back-up power generation for offices, workshops and facilities lighting (excluding all mining operations).
- Seeding, planting, fertilising and mulching of final land form.
- Setting out of the works.
- Construction of access roads that are outside the boundaries of the Mining Area.

4.8 Mining Operations

4.8.1 Equipment Selection

The equipment selected for the Tulu Kapi project and the basis for this selection is given in the 2015 DFS. This was further refined during the tender process and following discussion with the preferred mining contractor.

It is however expected that the ultimate specification will not vary materially from the machines outlined below.

Excavator

Three sizes of excavator are proposed for Tulu Kapi, each of which will perform specific mine production duties as identified in Table 4.9.

Table 4.9 Excavator Tasks by Machine Size

	Machine Size		
	40 t to 50 t	120 t to 150 t	180 t to 200 t
Borrow Pit Earthworks		☐	
Selective Mining		☐	
Bulk Excavation			☐
Batter Pulling	☐		
Rock Breaking	☐		
Topsoil Rehandle		☐	

Both the 120 t and 200 t machines will be capable of loading the haul trucks. The 120 t class machine was included for its selective mining capability and flexibility during the construction phase. The 200 t machine is the largest machine capable of loading the proposed mine trucks. This will enable higher production rates and reduce the number of loading areas required, thereby providing more flexibility within the working areas of the pit.

The 120 t machine will be brought to site during the construction period to produce borrow material for the ROM pad as well as magazine and emulsion plant pads. The 200 t machines will be mobilised prior to commissioning of the process plant.

The 120 t machines will perform the crucial duty of separating the ore and waste selective material at the hanging wall and footwall contact. This will prepare the area for the larger 200 t machines to operate more efficiently in removing the stockpiled selective material as well as the bulk material on the flitch. Two 120 t machines and up to two 200 t machines were allowed for in this study and the number of machines matches the requirement to achieve simultaneous mine production from three independent locations in the pit. Once all machines have been commissioned on site the installed maximum capacity of the machines is estimated to be circa 30 Mtpa. This compares to a scheduled maximum requirement of 24.5 Mtpa.

A smaller 40 t machine will be used predominantly to clean the batters of loose material and provide backup for sorting of the selective material. The same size machine will be fitted with a rock breaker to reduce oversize in the pit and on the ROM pad as required. Ancillary duties such as roadworks and drain clearing are assigned to this machine and only one machine is required for the Tulu mine.

Mine Dump Trucks

Rigid body 90 t class mine dump trucks are proposed for the project. This size machine maximises the use of the design width of the pit ramps and surface haul roads (25 m). The trucks will be typically 6 m wide and require a minimum running surface of 18 m for dual lane ramps and 9 m for single lane ramps. The remainder of the design width will allow for toe drains and safety windrows.

This size of truck was selected to also maximise the size of excavator which can be used in the pit for digging bulk ore and waste as well as re-handling the selective material stockpiled by the 120 t machine described earlier. This will minimise the number of loading areas required to maintain the proposed production rate.

Front End Loader

The production schedule has 41% of ore rehandled from the stockpiles, while 59% is direct tipped to the crusher. Ore will be rehandled from the ROM stockpile to the crusher by a Caterpillar 988 front end loader or equivalent size machine.

Grader

Provision was made for up to two graders to be included in the fleet. The proposed graders will have a 4.9 m (16 ft) mould board and will be used for haul road maintenance around the site.

The size of grader proposed is commonly used in combination with the proposed trucking fleet and was selected to minimise the number of passes required to maintain each section of road and therefore interference with the haulage fleet.

Drills

The blast hole drilling fleet will be a combination of top-hole-hammer drills and down-hole-hammer drills depending on the application. The drills will be small mobile boom mounted machines, rather than large deck mounted machines. The predominant hole size proposed is 127 mm, however a variety of hole sizes will be required depending on the application and the need to control fragmentation and mitigate blast damage.

4.8.2 Grade Control Drilling

A grade control pattern of 10 m by 10 m using 30 m holes with assay samples collected over a 1 m interval for one assay is included in the cost model.

Provision for Service Equipment

A range of service support equipment has been included as listed below:

- Rock breaker x 1.
- Fuel and Lube Truck x 1.
- Water Truck x 2.
- Lighting Towers x 8.

4.8.3 Light Vehicles

Four-wheel drive light vehicles were included in the mining study for the owner's team management supervisory roles. The allocation of four-wheel drive vehicles is given in Table 4.10.

Table 4.10 Light Vehicle Provision

Mining Management	Single Cab Utes	Twin Cab Utes	Land Cruiser Wagon	Total
Operations Manager			1	1
Technical Services Superintendent			1	1
Mining Engineer – Production			1	1
Mining Engineer – Drill & Blast			1	1
Senior Geologist			1	1
Mine Geologist		1		1
Senior Mine Surveyor		1		1
Mine Surveyors				
Field Technicians		1		1
Mine Operations Superintendent			1	1
Mining General Supervisor		1	-	1
Total	**0**	**4**	**6**	**10**

Table 4.11 Summary of Contractor Mining Fleet

Major Equipment		Total	YR-1	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Blast Hole Drill	Atlas T45 or Similar	1	1	-	-	-	-	-	-	-	-	-	-
Grade Control Drill	Atlas D65 or Similar	6	5	-	-	1	-	-	-	-	-	-	-
Hydraulic Excavator 180t (Waste, 9.5m3)	Liebherr R9250 Excavator	2	1	-	1	-	-	-	-	-	-	-	-
Hydraulic Excavator 120t (Ore, 4m3)	Liebherr R9150 Excavator	2	1	-	-	1	-	-	-	-	-	-	-
Haul Truck, 90t	Caterpillar 777D	18	8	4	3	3	-	-	-	-	-	-	-
Tracked Dozer, ?ft blade, 370kW	Cat D9R Dozer	5	4	-	-	1	-	-	-	-	-	-	-
Wheeled Dozer, 15ft blade, 400kW		-											
Hydraulic Excavator/ Rockbreaker 40t	Cat 336E Excav / breaker	1	1	-	-	-	-	-	-	-	-	-	-
Motor Grader (16ft)	Cat 16M Grader	2	2	-	-	-	-	-	-	-	-	-	-
Front-End Wheel Loader (5.4m3)	CAT 988	1	1	-	-	-	-	-	-	-	-	-	-
30,000 litres Water Truck	Cat 777D WT	1	1	-	-	-	-	-	-	-	-	-	-
Service Truck	TBA	3	3	-	-	-	-	-	-	-	-	-	-
Hiab Truck	TBA	1	1	-	-	-	-	-	-	-	-	-	-
Front-End Wheel Loader	Cat 966G FEL		2	-	-	-	-	-	-	-	-	-	-
Lighting Plants	TBA	14	8	4	-	2	-	-	-	-	-	-	-
Tool Handler	Cat 966 FEL- tyre handler	1	1	-	-	-	-	-	-	-	-	-	-
Tool Handler	Cat IT28 Integrated Tool	1	1	-	-	-	-	-	-	-	-	-	-
Crane	80t Workshop Crane (mobile)	1	1	-	-	-	-	-	-	-	-	-	-
Light Vehicles	TBA	18	18	-	-	-	-	-	-	-	-	-	-
Mobile Crusher	TBA	1	1	-	-	-	-	-	-	-	-	-	-
Pit De-watering Pumps	TBA		1	-	-	-	-	-	-	-	-	-	-
Total Units													

4.8.4 Explosives Supply

A bulk manufacturing facility and a mobile manufacturing unit will be supplied by an experienced explosive services provider.

A supply and storage site will be established on the mine from where the bulk explosives service will be managed. The site will consist of a storage facility for chemicals, emulsion manufacturing facility and explosives magazine complex. A maintenance workshop, ablution and change house, offices and magazine will form part of the start-up phase and will be provided by KEFI.

The raw materials will be supplied with Explosives and Initiating systems being sourced from South Africa or Zambia. KEFI will perform the site preparation while the civil construction will form part of the construction phase of the mine, which will be completed by the contractor.

4.8.5 Pit Dewatering and Drainage

Water entering the pit will be discharged into the raw water diversion dam. Portable pit dewatering pumps capable of delivering 7 ML per day at 150 m total head and associated discharge lines will be supplied by the Contractor.

During operations the size of the pit will increase resulting in an increased catchment and ground water inflow potential. Additional pumps will be provided by the Contractor to cover for this increased inflow as well as the increase in head resulting from deepening of the pit.

Water inflows exceeding 7 ML/day will be managed by the Contractor at an additional cost in the pricing schedule.

4.9 Mining Personnel

In order to effectively manage the operations at Tulu Kapi, a labour schedule was drawn up to include labour for mining, processing and administrative duties as part of the 2015 DFS.

4.9.1 Owner's Mining Department Personnel

With the revised strategy of contract mining operations rather than owner operator mining, the Owner's Mining Department labour schedule was revised.

Mine management for the Tulu Kapi mine will be headed by a general manager who will be supported by departmental managers as shown in Figure 4.13. The duration of service required from the expatriate before he is replaced by a national counterpart is also indicated.

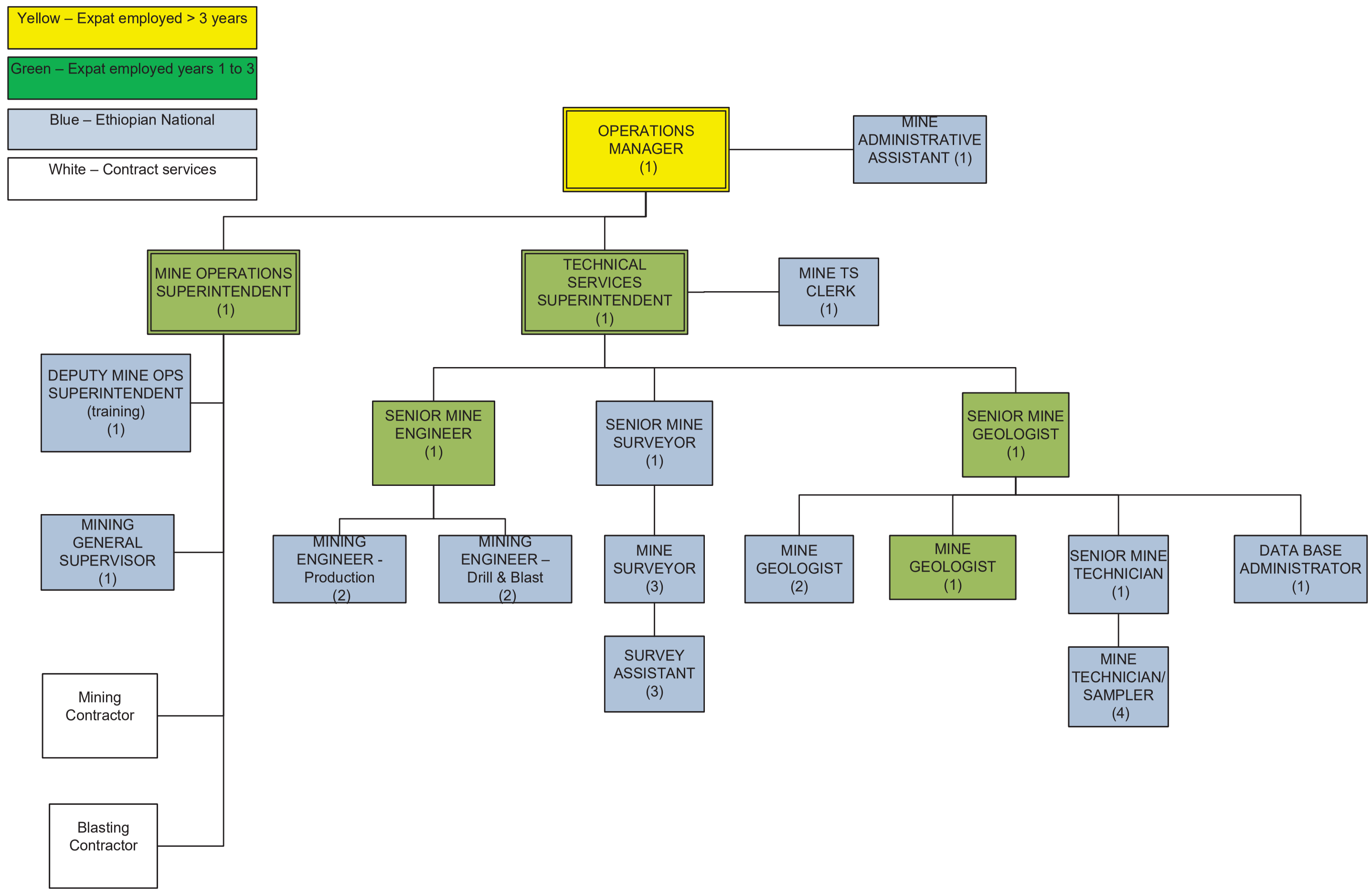
Some management positions will require expatriates for the life of mine and some will only require expatriates for the first few years of operation, after which they will be handed over to a trained Ethiopian national. A national worker, trained under the guidance of an expatriate, will receive hands-on training in that specific role and will be able to replace the expatriate within a specified time.

Table 4.12 shows a list of positions that will be held by expatriates. Expatriate 1 position will be held by highly experienced expatriates with senior management experience in Africa, Expatriate 2 positions will be expatriates with technical or supervisory experience in Africa.

Table 4.12 Owners Labour Schedule

Position	Job Grade	Source	Number	Duration (years)
Operations Manager	E4	Expat 1	1	>3
Mine Administrative Assistant	C1	Local	1	
Technical Services Superintendent	D4	Expat 1	1	3
Mine Operations Superintendent		Expat 2	1	3
Deputy Mine Operations Superintendent		National	1	
Mining General Supervisor		National	1	
Mine Technical Services Clerk	B1	Local	1	
Reporting Clerk	B1	Local	0	
Senior Mining Engineer	D4	Expat 1	1	3
Mining Engineer - Production	D2	Local	2	
Mining Engineer - Drill and Blast	D2	Local	2	
Senior Mine Geologist	D4	Expat1	1	3
Mine Geologist		Expat 2	1	3
Mine Geologist	D1	Local	2	
Senior Mine Technician	B4	Local	1	
Mine Technician/Sampler	B1	Local	4	
Senior Mine Surveyor	D2	Local	1	
Mine Surveyor	C4	Local	3	
Survey Assistants	B1	Local	3	
Database Administrator	C3	Local	1	
Total Mine			**29**	

Figure 4.13 Owners Mining Department Organisational Structure



4.9.2 Contract Mining Personnel

It is anticipated that the majority of the Tulu Kapi mine's workforce will be sourced locally and it is KEFI's policy to maintain this practice to the fullest extent possible, with only key management and supervisory personnel sourced outside the country. It is likely that a large contingent of employees will be sourced from the Tulu Kapi, Gimbi, Ayra and Nekemte villages and towns. The development of skills required to operate a gold mine will be fostered by KEFI. There appear to be no constraints regarding access to a pool of unskilled and semi-skilled labour and the future development of a skills base in the region.

A basic schedule for manpower as provided by the preferred contractor is outlined in Table 4.13

Table 4.13 Mining Contractor Labour Schedule

Position	Status	Y -1	Y 1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10
Western Expatriates	Expat 1	5	5	5	5	5	5	5	5	3	3	3
African Expatriates	Expat 2	18	12	12	12	12	12	12	12	8	8	6
National Staff and Supervision	Local	39	39	52	52	52	52	52	52	52	52	52
National Operators - Drilling	Local	7	9	13	15	15	9	7	5	1	0	0
National Maintainers - Drilling	Local	7	9	12	12	12	9	7	7	4	0	0
National Operators - Blasting	Local	8	11	16	19	19	11	8	8	3	0	0
National Maintainers – Bits / Hammers	Local	4	4	4	4	4	4	4	4	4	4	0
National Operators – Mining	Local	40	84	92	96	100	96	112	116	80	64	11
National Maintainers - Mining	Local	31	65	72	76	80	77	93	97	61	47	6
Subtotal - Mine Operations		**160**	**159**	**238**	**278**	**291**	**299**	**275**	**300**	**306**	**216**	**178**

4.9.3 Explosives Contract Mining Personnel

A basic schedule for manpower as provided by the contractor is outlined in Table 4.14.

It is anticipated that initially the skilled personnel will be sourced nationally and the semi-skilled and un-skilled will be sourced locally.

Table 4.14 Explosives Contractor Labour Schedule

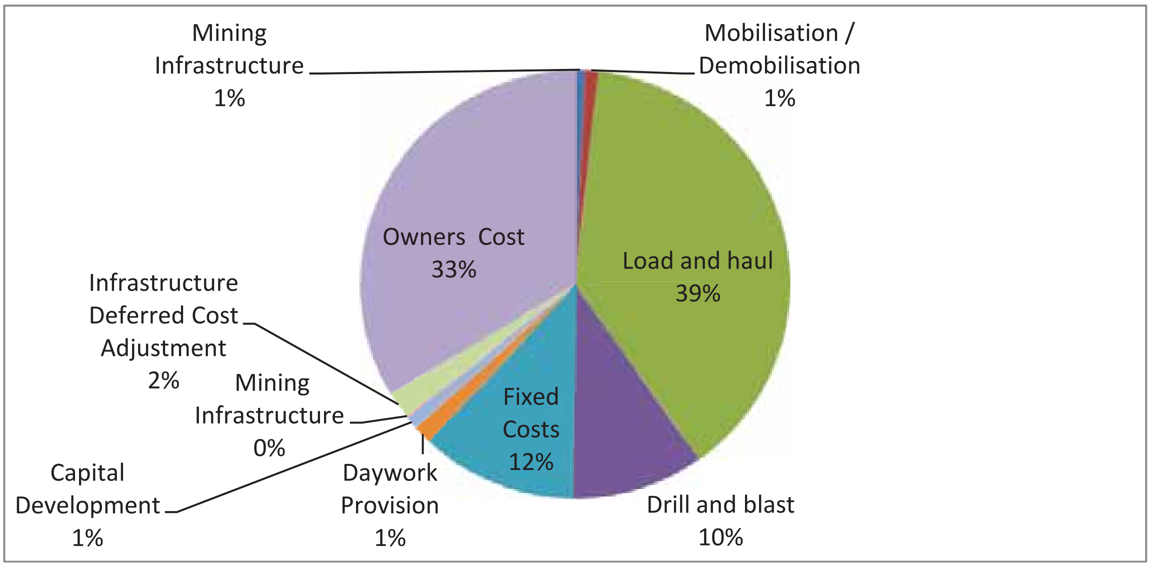
Operations	Skills and Qualifications	Number of Personnel	Task
Site Manager (Full time expat)	Skilled	1	Overall responsibility for safe management of the onsite operation, daily liaison, basic blast design, inventory management, site administration
Plant Foreman	Skilled	1	Responsible for safe manufacturing of emulsion, plant supervision, plant management, raw materials management, production. Environmental responsibility; Relief Site Manager.
Operations Assistants -Plant D/S	Unskilled	6	AN handling, forklift operations, housekeeping, assisting hydraulic fitter where necessary.
Bench Foreman	Semi-Skilled	1	Manages and organizes on bench operation, reconciliations and customer documentation.
MMU Operator	Semi-Skilled	1	Safe operation of MMU, delivery of quality product down-the-hole; charging data records.
Operations Assistants -on bench	Unskilled	4	Hose handling, cup sampling, assisting hydraulic fitter where necessary.
Technical Support			
Hydraulic Fitter	Skilled	1	Maintenance of emulsion plant and MMU process, including all safety systems, pumps, boilers, compressor, augurs, motors, PLCs etc.
Total		**15**	

4.10 Mining Operating Cost

4.10.1 Basis of Estimate Mine Operating Cost

The total mine operating costs, based on a contractor operated scenario, was estimated to be US$441 million for the life of mine, which excludes pre-production costs and sustaining capital discussed in the section on Capital Cost Estimate in this report. Based on a total material movement of 130 million tonnes the unit operating cost was estimated to be $3.40 per tonne. This compares to the 2015 DFS owner operator mining cost estimate of $2.68, the key difference being the amortisation of capital equipment now carried in the contractor's unit cost. Figure 4.14 provides a summary of the distribution of mine operating costs over the life of mine.

Figure 4.14 Distribution of Mine Operating Costs



The mine operating costs are summarised in Table 4.15 with the operation of the mining and ancillary equipment being the largest of the cost areas. A bottom up, first principles approach was used as the basis of estimating the operating costs for the open pit mining operations. The costs were compiled from a variety of sources including:

- Labour salary survey for the Tulu Kapi project.
- Non-binding budget quotations from mining contractors.
- Non-binding budget quotations from explosive suppliers.
- Vendor quotations specific to the project.
- Database costs for similar projects.

Table 4.15 Mine Operating Cost Summary

Item Description	LOM Estimated Value	Cost/Mined Tonne
	(US$)	(US$/t)
Mining Infrastructure	3,156,990	0.02
Mobilisation / Demobilisation	4,235,465	0.03
Load and haul	170,150,099	1.31
Drill and blast	43,824,517	0.34
Fixed Costs	51,751,221	0.40
Daywork Provision	6,289,810	0.05
Capital Development (Clearing, Waste Dump, ROM pad, Haul Road, Emulsion, Magazine, Borrow)	4,345,775	0.03
Mining Infrastructure	690,873	0.01
Subtotal Mining Costs	**284,444,750**	**2.19**
Mining Contractor Infrastructure Deferred Cost Adjustment	8,753,312	0.07
Owners Cost	148,048,312	1.14
Total Cost	**441,246,375**	**3.40**

Drill and blast and load and haul are the predominant cost drivers. These costs include lubricants, spares, tyres, ground engaging tools, general maintenance and cost of onsite labour for operator and maintenance as supplied by the contractor. Fuel is also allowed for but will be a direct cost to KEFI. Fuel will be dispensed from a facility owned by the fuel supply contractor at a cost of $0.72 per litre.

4.10.2 Mine Owner’s Labour Costs

Mine department owner’s team labour will comprise expatriates, national and local labour. The expatriate labour category refers to labour sourced outside of Ethiopia. This category is split into two types; Expatriates 1 position which will be held by highly experienced expatriates with senior management experience in Africa and worldwide, who are most likely to be sourced from North America, Europe, RSA or Australia and Expatriate 2 positions who will be expatriates with technical or supervisory experience in Africa.

National labour refers to labour sourced from Ethiopia but not within the mine locale. Local labour is sourced from the communities close to the mine. The labour total costs to company were determined using the basis described below.

The mine expatriate labour cost includes the following:

- Labour remuneration.
- Ethiopia in-country taxation.
- Vacation / sick leave.

- GPA and illness insurance.
- Social insurance.
- Airfares.
- Social security.

The following costs have been excluded as they have been included in the G&A operating costs:

- Camp food and catering costs.
- Safety supplies costs.
- Training costs.
- Consultants' fees.

Mine operations and supervisory staff will work on a 3 × 8 hour shift per day, 7 days a week. Management and technical staff will work day shifts only, but will be on standby after hours on a rotational basis.

Management and technical staff will work on a 1 × 8 hour shift per day, 5 days a week. Expatriates and national labour will be expected to work on a 6 weeks on and 2 weeks off cycle. During the 6 weeks on duty, the expatriates and national labour will reside in the camp facility on site. During the 2 weeks off, they will have the opportunity to return to their country / town of permanent residence, after which they will return to commence the next 6 weeks on duty.

The expatriate labour rates are based on rates that have been benchmarked against mines already operating in Africa. The national and local labour rates are based on existing KEFI rates, technical rates in the marketplace, and comparisons done based on the experience required to fill roles that are not common in Ethiopia.

The labour cost detailed breakdown is given in Table 4.16.

The Patterson grading method was used for the job grading exercise. Employees are graded according to salary scale ranging from Level A1 (lowest paid, typically labourers) to Level E (highest paid, typically senior management).

Table 4.16 Mine Labour Cost Breakdown

Position	Job Grade	Category	No. of Employees	Cost pp / Month	Cost pp / Annum	Total Annual Cost to Company
				(US$)	(US$)	(US$)
Mine Operations						
Operations Manager	E4	Expat 1	1	15,672	188,068	249,200
Mine Administrative Assistant	C1	Local	1	1,007	12,089	15,817
Mine Technical Service Department						
Technical Services Superintendent	E3	Expat 1	1	12,538	150,455	203,123
Mine Technical Services Clerk	B1	Local	2	435	5,215	13,647
Senior Mining Engineer	D4	Expat 2	1	6,533	78,392	102,912
Mining Engineer	D2	National	4	2,283	27,398	143,383
Senior Mine Geologist	E2	Expat 1	1	10,555	126,656	173,970
Mine Geologist	D5	Expat 2	1	7,470	89,636	295,959
Mine Geologist	D1	National	2	1,939	23,273	60,899
Senior Mine Technician	B4	National	1	813	9,759	12,768
Mine Technician/Sampler	B1	Local	4	435	5,215	27,294
Senior Mine Surveyor	D2	National	1	2,283	27,398	35,846
Mine Surveyor	C4	National	3	1,566	18,787	73,738
Survey Assistants	B4	Local	3	813	9,759	38,303
Data Base Administrator	C3	Local	1	1,407	16,879	22,083
Subtotal - Technical Services and General Management			**27**	**65,748**	**788,980**	**1,468,941**
Mine Operations						
Mine Operations Superintendent	D4	Expat 1	1	6,533	78,392	114,846
Deputy Mine Operations Superintendent (Training)	C5	National	1	1,743	20,910	27,357
Mining General Supervisor	D2	National	1	2,283	27,398	35,846
Total Mine Labour			**30**	**65,748**	**788,980**	**1,468,941**

4.10.3 Mining Overhead

Provision was made within the estimate for operating costs associated with the KEFI owner's mining team. The costs cover for the following expenses:

- Fuel for owner's team light vehicles.
- Maintenance of the owner's team light vehicles.
- Mining related software expenses.
- Sampling and surveying consumables.

4.10.4 Contractor Costs

Non-binding tender submissions were sourced by KEFI from a select number of experienced mining contractors to undertake the majority of the mining works. The pricing was sourced on the basis of selecting a preferred contractor with whom to negotiate final and binding pricing and contract terms and conditions. The works comprised a conventional mining contractor scope:

- Clearing and grubbing of surface vegetation.
- Topsoil removal and stockpiling.
- Overburden removal of waste material.
- Selective mining of ore.
- Drilling and blasting of rock.
- Reverse circulation grade control drilling.
- Loading the primary crusher with ore from the ROM pad.
- Dewatering the pit excavation.
- Maintenance of roads.
- Shaping and rehabilitating waste dumps.
- Management and supervision of the plant and equipment.
- Maintenance of the Contractor's plant and equipment.
- Various miscellaneous works required by KEFI under day work.

An extensive pricing schedule was completed by the tenderers and a preferred contractor was selected on contract value and experience. A summary of the preferred contractor's cost burden on the project is provided in Table 4.15 above.

In addition to the mining service contract non-binding budget proposals were sourced from an experienced explosive supplier and service provider who operates in a variety of countries throughout the African continent. The scope of the explosive services is as follows:

- Build, operate and maintain an onsite emulsion storage and where applicable manufacturing facilities.
- Build and operate an onsite explosive magazine facility.
- Issue explosives to the mining contractor for use in priming and initiating blast holes.
- Supply of emulsion product into the blast hole via a Mobile Processing Unit (MPU).

The explosive services were quoted on a fixed and variable basis. The fixed costs are included in the contractor fixed charges shown in Table 4.15 above. The variable charges for explosive product are included under the drill and blast costs in Table 4.15.

All contract charges are exclusive of import duties, withholding taxes, excise and surtax.

5.0 METALLURGICAL TESTWORK

5.1 Introduction

Test work has been carried out since 2011 for the Tulu Kapi Gold Project involving the processing of ore mined from open pit, on both oxide ore and fresh ore. The programs completed were:

- 2011 PFS (Pre-feasibility Study) to establishing the basic flowsheet and effect of different conditions and parameters.
- 2012 DFS (Definite Feasibility Study) to confirm gold recovery efficiencies through a combination of gravity separation and cyanidation leaching as well as establishing tailings detoxification parameters and additional comminution testwork to support the process design parameters for a conventional gold recovery plant.

During the 2015 DFS no further testwork was carried since previous testwork had already established the optimum process routes and parameters for gold extraction.

Following the 2015 DFS and the engagement of Lycopodium Pty Ltd as the preferred contractor for the construction of the processing plant, Lycopodium completed a Front End Engineering Design Study (FEED) in mid 2016. The study was for the design and construction of an integrated processing facility for the Tulu Kapi Gold Project to treat a nominal 1.5 Mtpa of oxide and fresh ore (vs 1.2 Mtpa used as the basis for the 2015 DFS).

The FEED study undertook a detailed review of past metallurgical testwork samples, as well as the supervision and confirmation of the comminution circuit design based on the different ore blends to be treated during the open pit Life of Mine (LOM) operations.

Results of previous metallurgical studies are not fully repeated in this document. Detailed results can be found in the 2015 DFS Appendices.

The results of the testwork from both the PFS and the DFS campaigns indicated the following:

- The oxide and transitional ores are of medium hardness and fresh ore becomes harder with increasing depth.
- All the ore types (oxides and fresh) are amenable to gold extraction by conventional cyanidation.
- Recovery testwork with and without gravity separation showed that gravity separation did not significantly increase overall gold recovery and gold. Therefore ROM cyanidation was the selected process route.

5.2 Variability Testwork and Grind Size Optimisation

Upon completion of the 2015 DFS KEFI opened the bidding process for the construction of the process plant and the operation of the mine.

Following discussions with several of the short listed engineering contractors, not only did it became apparent that an increase in processing plant capacity from 1.2 Mtpa to 1.5 Mtpa could be achieved with negligible increases in capital costs and without requiring any changes to the mine plan, but capital and operating cost reductions could also be achieved by increasing grind size from the previously chosen P_{80} = 75 µm to 150 µm for the fresh ore and 125 µm for the oxide ore, with only minor loss in gold recovery.

During the 2012 DFS, 32 samples in all from various locations were subjected to specific testwork to assess variability within the ore body, including both gold recovery and comminution. These samples comprised 11 samples from geographically diverse oxide sources for grindability and extraction testwork, 16 samples from spatially diverse fresh ore sources specifically for extraction testwork, and five samples from spatially diverse fresh ore sources for both comminution variability and extraction testwork.

Oxide ore recoveries at P_{80} = 150 µm ranged between 90.5% and 98.0% for gold and 65.1% and 97.2% for silver as shown in Table 5.1 below.

Table 5.1 Oxide Ore Au and Ag Variability Results at 150 µm

Sample ID	Feed		Recoveries	
	Au (g/t)	Ag (g/t)	Au (%)	Ag (%)
V-2	2.35	0.43	97.0	65.1
V-3	3.83	0.52	94.4	71.3
V-4	0.99	0.45	97.0	66.8
V-5	1.96	0.78	98.0	80.8
V-6	2.53	0.61	90.5	75.6
V-8	2.45	2.20	94.7	93.2
V-9	1.15	3.83	95.6	92.2
V-10	1.15	2.83	93.0	94.7
V-11	1.48	5.35	93.3	97.2
V-12	2.10	2.79	92.9	94.6
Average	**2.00**	**1.98**	**94.64**	**83.2**

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Soft fresh ore recoveries at P_{80} = 150 µm ranged between 88.1% and 97.0% for gold and 38.4% and 85.5% for silver as shown in Table 5.2 below.

Table 5.2 Soft Fresh Ore Au and Ag Variability Results at 150 µm

Sample ID	Test No	Feed		Recoveries	
		Au (g/t)	Ag (g/t)	Au(%)	Ag (%)
V-1	BK694	1.31	0.90	95.80	66.5
V-2	BK695	1.56	0.60	96.79	75.1
V-3	BK696	2.95	1.45	96.95	58.6
V-4	BK697	2.44	1.09	91.79	63.4
V-5	BK698	3.07	1.02	94.13	85.3
V-6	BK699	1.61	1.05	93.18	52.3
V-7	BK700	1.72	2.92	95.94	38.4
V-8	BK701	2.77	1.00	96.03	85.5
V-17	BK710	1.34	0.60	88.09	73.7
V-18	BK711	1.46	0.50	92.47	71.2
Average		**2.02**	**1.11**	**93.1**	**67.0**

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Hard fresh ore recoveries at P_{80} = 150 µm ranged between 75.6% and 97.3% for gold and 44.3% and 88.3% for silver as shown in Table 5.3 below.

Table 5.3 Hard Fresh Ore Au and Ag Variability Results at 150 µm

Sample ID	Test No	Feed		Recoveries	
		Au (g/t)	Ag (g/t)	Au (%)	Ag (%)
V-9	BK702	1.94	0.80	95.36	81.7
V-10	BK703	1.29	0.60	93.80	75.8
V-11	BK704	1.87	1.30	91.95	69.7
V-12	BK705	3.38	1.30	97.34	88.3
V-13	BK706	2.47	1.20	94.13	87.2
V-14	BK707	1.94	2.20	89.69	45.2
V-15	BK708	0.93	0.40	92.44	65.5
V-16	BK709	1.60	0.60	89.99	73.7
V-19	BK712	1.40	0.40	95.72	63.8
V-20	BK713	2.05	0.60	96.11	74.7
V-21	BK714	0.37	0.30	75.88	44.3
Average (sample V-21 not included in average)		**1.89**	**0.94**	**93.7**	**72.6**

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Leaching testwork based on a P_{80} = 75 µm grind size was also performed. The difference in solid tails gold assay between the two different grind sizes indicates that only a small improvement in recovery can be expected in the majority of the cases by a finer grind.

Tables 5.4 to 5.6 below highlight the difference in the oxide ore residue grades between 75 and 150 µm grind sizes using the same variability samples under identical test conditions.

Table 5.4 Au Solids Tail Grade Comparison for Oxide Ore

Sample ID	Au Head Grade			Au Solids Tail Grade 75 µm (g/t)	Au Solids Tail Grade 150 µm (g/t)	ΔAu Solids Tail Grade (g/t)
	Assay (g/t)	Calculated				
		75 µm (g/t)	150 µm (g/t)			
V-2	3.23 / 3.27 / 5.44	2.24	2.35	0.075	0.07	-0.005
V-3	3.96 / 3.34 / 3.53	3.97	3.83	0.18	0.22	0.035
V-4	0.79 / 1.02 / 0.75	1.15	0.99	0.01	0.03	0.02
V-5	1.79 / 1.88 / 1.98	1.86	1.96	0.03	0.04	0.01
V-6	2.40 / 2.78 / 2.09	1.85	2.53	0.1	0.24	0.14
V-8	2.49 / 3.10 / 3.42	2.68	2.45	0.05	0.13	0.08
V-9	0.83 / 1.04 / 1.33	1.48	1.15	0.05	0.05	0
V-10	1.14 / 0.99 / 1.20	0.94	1.15	0.04	0.08	0.04
V-11	1.45 / 1.14 / 1.05	4.09	1.48	0.28	0.10	-0.18
V-12	1.59 / 2.33 / 3.45	2.00	2.10	0.055	0.15	0.095
Average		**2.23**	**2.00**	**0.09**	**0.11**	**0.024**

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Table 5.5 Au Solids Tails Grade Comparison for Soft Fresh Ore

Sample ID	Au Head Grade			Au Solids Tail Grade 75 µm (g/t)	Au Solids Tail Grade 150 µm (g/t)	ΔAu Solids Tail Grade (g/t)
	Assay (g/t)	Calculated				
		75 µm (g/t)	150 µm (g/t)			
V-1	1.50 / 1.30 / 0.88	1.01	1.31	0.04	0.06	0.015
V-2	1.25 / 1.52 / 1.38	1.52	1.56	0.06	0.05	-0.01
V-3	2.24 / 2.49 / 2.62	2.57	2.95	0.13	0.09	-0.04
V-4	2.40 / 2.30 / 2.91	2.39	2.44	0.14	0.20	0.06
V-5	1.97 / 2.61 / 2.50	2.69	3.07	0.12	0.18	0.06
V-6	1.36 / 1.38 / 1.26	1.93	1.61	0.07	0.11	0.04
V-7	1.24 / 1.73 / 2.66	1.53	1.72	0.05	0.07	0.02
V-8	1.37 / 1.45 / 2.81	2.04	2.77	0.11	0.11	0
V-17	1.44 / 1.76 / 1.22	1.34	1.34	0.06	0.16	0.1
V-18	1.29 / 1.03 / 1.13	1.14	1.46	0.06	0.11	0.05
Average		**1.82**	**2.02**	**0.08**	**0.11**	**0.030**

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Table 5.6 Au Solids Tail Grade Comparison for Harder Fresh Ore

Sample ID	Au Head Grade			Au Solids Tail Grade 75 µm (g/t)	Au Solids Tail Grade 150 µm (g/t)	ΔAu Solids Tail Grade (g/t)
	Assay (g/t)	Calculated 75 µm (g/t)	Calculated 150 µm (g/t)			
V-9	1.96 / 2.08 / 2.20	2.38	1.94	0.06	0.09	0.03
V-10	1.34 / 0.40 / 1.24	1.34	1.29	0.07	0.08	0.01
V-11	1.22 / 1.33 / 0.94	1.43	1.87	0.13	0.16	0.025
V-12	2.19 / 1.24 / 1.39	4.60	3.38	0.06	0.09	0.03
V-13	2.02 / 2.67 / 2.35	1.90	2.47	0.06	0.15	0.085
V-14	2.42 / 2.47 / 2.18	1.94	1.94	0.16	0.20	0.04
V-15	1.16 / 0.95 / 4.01	1.29	0.93	0.05	0.07	0.02
V-16	1.66 / 1.76 / 1.93	2.20	1.60	0.08	0.16	0.08
V-19	1.42 / 1.14 / 1.34	1.49	1.40	0.05	0.06	0.01
V-20	3.44 / 3.49 / 3.22	2.27	2.05	0.11	0.08	-0.03
V-21	0.50 / 0.38 / 0.54	0.52	0.37	0.17	0.09	-0.08
Average		**1.94**	**1.75**	**0.09**	**0.11**	**0.020**

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The above tests were performed with gravity separation; separate tests demonstrated that gravity separation did not significantly increase overall gold recovery.

The metallurgical results indicate gold recovery is relatively insensitive to grind size and any gold recovery benefits derived from finer grinding are not economically supported due to increases in capital (grinding mill size / power) and operating costs of the optimised circuit design.

No slurry handling difficulties are anticipated at the relatively coarse grind P_{80} of 150 µm and many process plants operate at this grind size.

Based on the testwork and input from engineering companies to capitalise on the opportunity to decrease initial capital cost, the optimum grind size for the FEED was established as being P_{80} = 150 µm.

5.3 Refinements to the Recovery Model

The metallurgical factors and the grade recovery algorithms for the 2015 DFS were developed by SENET and reviewed by Snowden. Metallurgical recoveries were applied to the Snowden optimisation, Snowden production schedule and KEFI's 2015 DFS financial model. For the 2015 DFS overall recovery over LOM was estimated to be 91.5% based on a P_{80} = 75 µm.

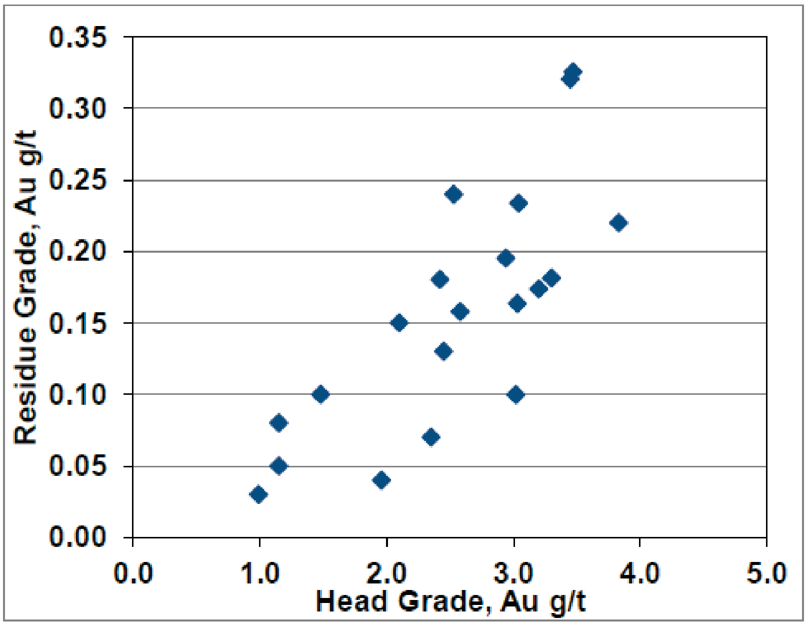
Micon International Limited (Toronto, Canada) reviewed the metallurgical testwork as part of their review of the 2015 DFS and concluded that the grade-recovery algorithms used in the DFS were conservative. In generating the recovery versus head grade equations for the different ore lithologies (Oxide, Soft and Hard Fresh ore) presented in the 2015 DFS at 75 µm grind sizes, several samples were discarded as being anomalous and MICON disagreed with the approach of disregarding the selected samples.

Based on their review they concluded that a gold recovery upside of an additional 2% above the 91.5% used in the DFS would not be unreasonable.

Further investigations with the aim of developing grade recovery algorithms that could be used in financial modelling used the testwork results from AMMTEC reports A14136 – Fresh Ore and A14207 – Oxide Ore as the basis of the analysis.

The algorithms for the coarser grind of 150 µm as applied to FEED were generated without discarding samples as was done in the 2015 DFS. The results in Figure 5.1 show that there appears to be a low to medium level correlation between the residue grade and the head grade for the oxide ore and the equation was as follows:

Figure 5.1 A14207 – Oxide Ore - Testwork Head Grade vs Residue Grades

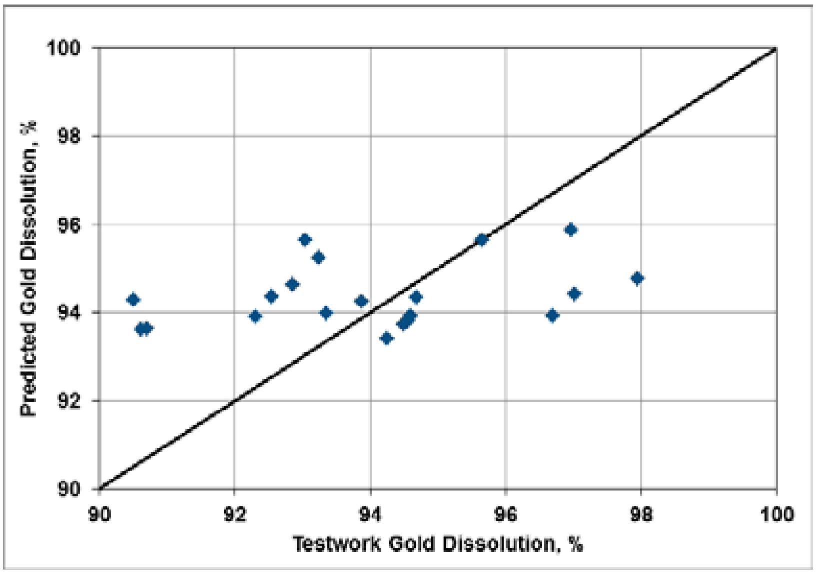


$$\text{Gold dissolution, \%} = \frac{(\text{Head Grade}- (0.0414 * \text{Head Grade})\hat{}\ 1.3456)*100}{\text{Head Grade}},$$

This equation (which gives a R^2 = 0.6515 correlation to the data shown) was then used to determine the predicted gold dissolution which was plotted against the test work gold dissolutions as shown in Figure 5.2. The results show that there was no relationship between the predicted and testwork gold dissolutions.

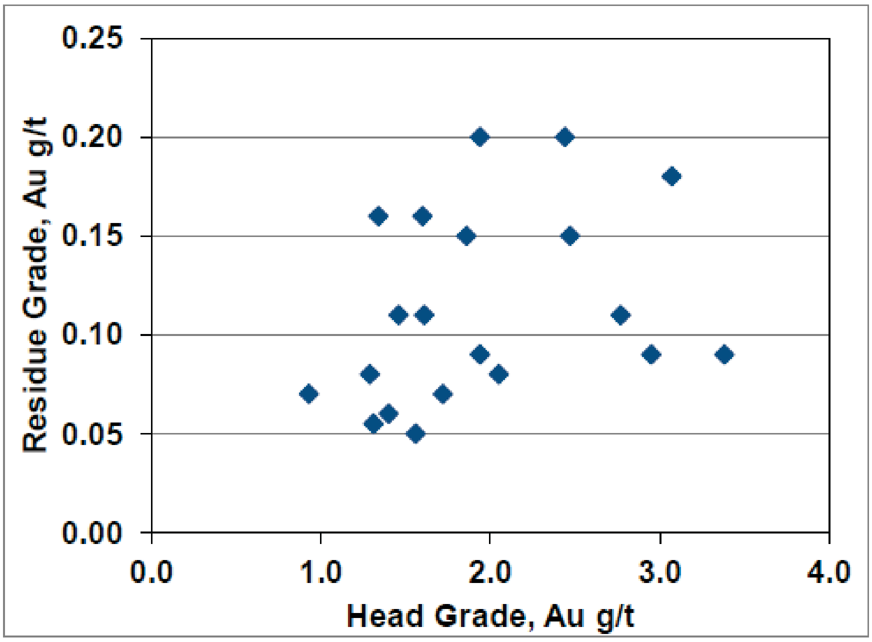
On the basis of these results the average gold dissolution as shown in Table 5.1 of 94.0% was used for the oxide ore.

Figure 5.2 A14207 –Testwork Gold Dissolution vs Predicted Dissolution – Oxide Ore



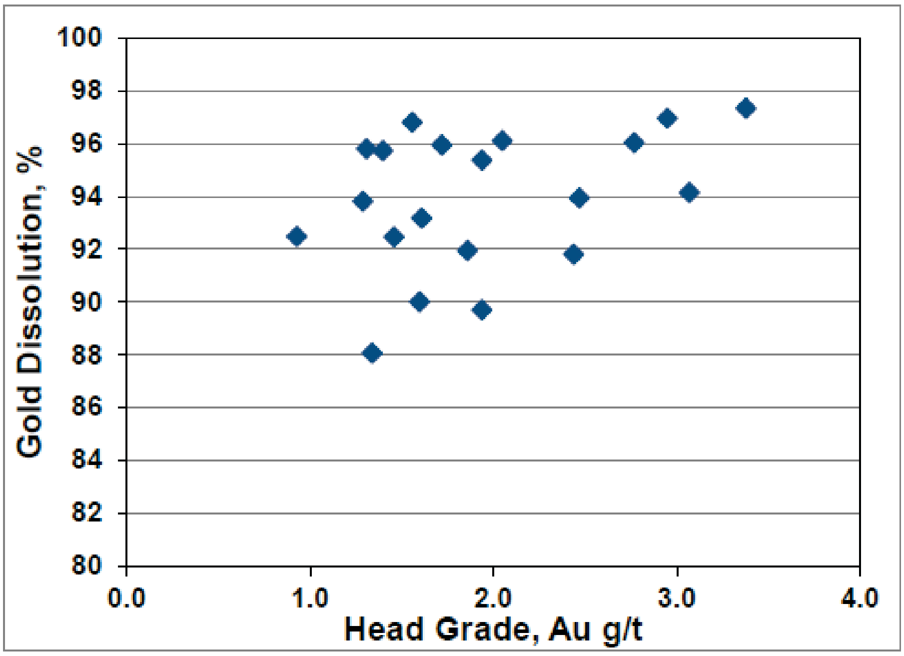
The Fresh Ore was not categorised into either 'Soft Fresh' or 'Hard Fresh' ore in the test reports. Consequently, all data had to be grouped together. The results for the fresh ore are given in Figure 5.3.

Figure 5.3 A14136 Fresh Ore - Testwork Head Grade vs Residue Grades



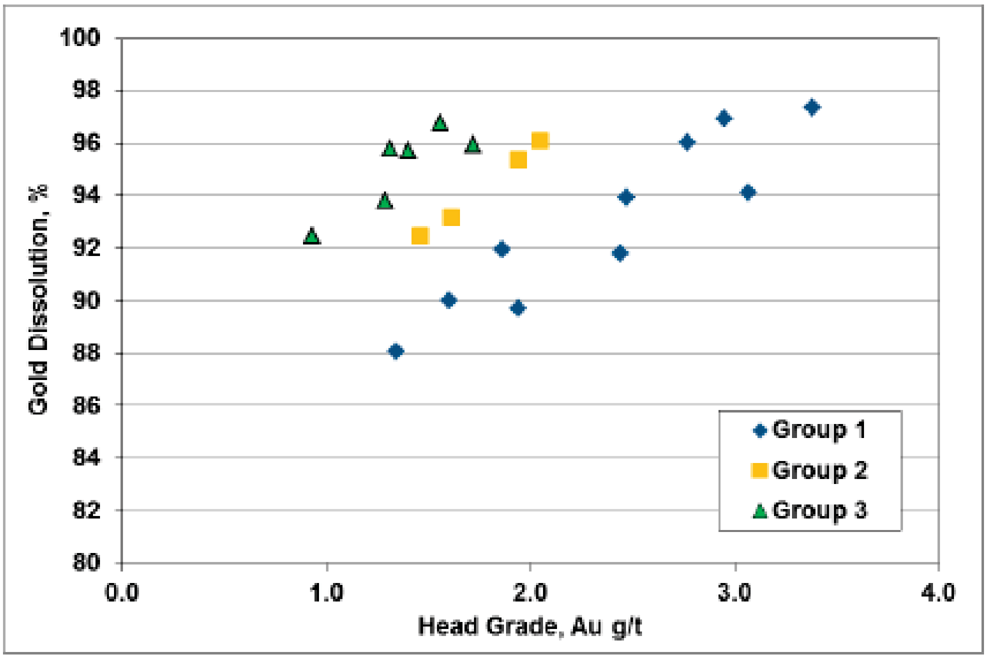
The results in Figure 5.3 do not show any discernible relationship between the residue grade and the head grade. An attempt was made to develop a relationship between the gold dissolution and the head grade and the results are shown in Figure 5.4.

Figure 5.4 A14136 Testwork Head Grade vs Gold Dissolution



From the results in Figure 5.4, no strong correlation between head grade and gold dissolution relationship could be established; however the data appeared to consist of possibly three groups as shown in Figure 5.5.

Figure 5.5 A14136 Testwork Head Grade vs Gold Dissolution – Grouped

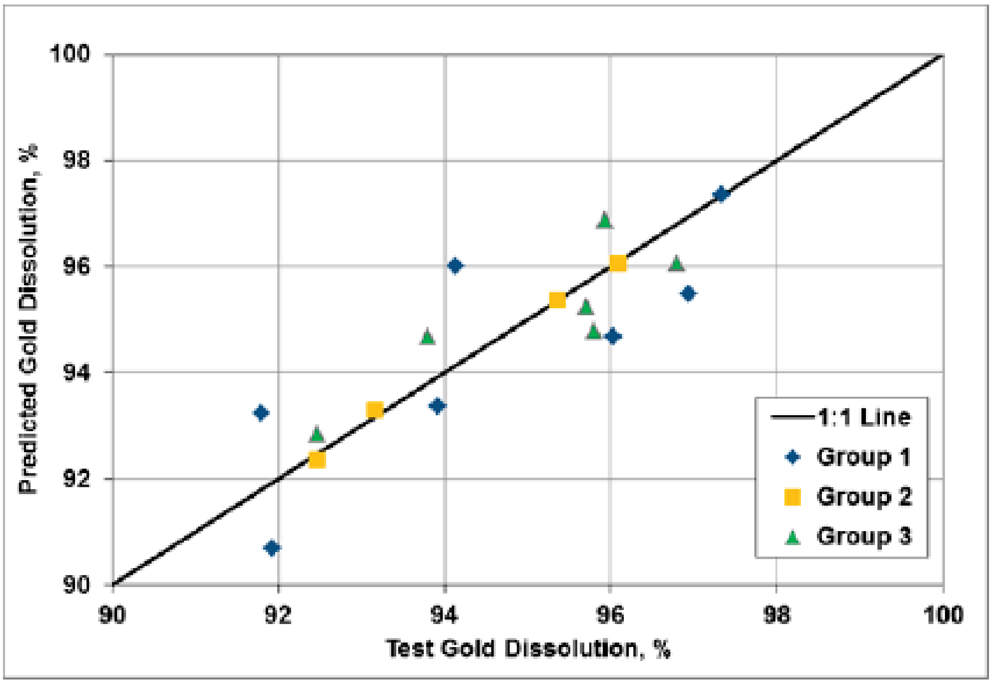


Based on the results presented in Figure 5.6, it was possible to develop useable head grade gold dissolution relationships which were as follows:

Series 1	Gold dissolution, % = 82.55 + 4.383 * Head Grade,	R^2 = 0.854
Series 2	Gold dissolution, % = 83.24 + 6.260 * Head Grade,	R^2 = 0.997
Series 3	Gold dissolution, % = 88.12 + 5.092 * Head Grade,	R^2 = 0.723

The predicted gold dissolutions were plotted against the test gold dissolutions as shown in Figure 5.6 and the results show a good correlation between the testwork and predicted gold dissolutions. Further analysis of the geological and/or mineralogical factors should be conducted to determine whether or not these groupings can be supported.

Figure 5.6 A14136 Testwork Gold Dissolution vs Predicted Dissolution – Fresh Ore



Based on the foregoing analysis, for the fresh ore, the Series 1 gold dissolution relationship was used as this is the most conservative. For the hard fresh ore a further 1% discount was applied in the financial model. Hence the following was applied in the financial model:

Oxide Ore:	Average recovery of 94%
Soft Fresh Ore:	Gold dissolution, % = 82.55 + 4.383 * Head Grade
Hard Fresh Ore:	(Gold dissolution, % = 82.55 + 4.383 * Head Grade)*0.99

The resultant algorithms result in average recoveries over the LOM as shown in Table 5.7.

Table 5.7 Average Gold Recovery for Different Ore Types Based on the LOM Schedule

Ore Type	Recovery	Percent Processed
Oxide Ore	94.0%	6%
Fresh Ore	92.85%	66%
Fresh Hard Ore	94.12%	28%
Average	**93.33%**	**100%**

5.4 Optimisation of Grinding Circuit Configuration

Orway Mineral Consultants (OMC) selected a grinding circuit based on the anticipated mining schedule, predicted ore hardness and selected grind size. A single stage SAG mill (SS SAG) was recommended. The comminution circuit could be expanded later to include a ball mill for treatment of harder fresh ores to maintain throughput rates, if required. The optimum grind size at that time would be selected using operational data, and additional testwork data to drive the selection of the ball mill according to the power requirements to reach the target grind size.

Further investigations by OMC during FEED suggested that an initial larger SAG mill installation would not require any further circuit upgrades in the future. Nevertheless, the FEED incorporated the capability of expanding the milling circuit if required.

OMC provided indicative specific energy requirements for each comminution sample tested to enable the resource modelling to account for the hardness profile with increased accuracy.

Previously the hardness interface was set at 1,600 mRL, which resulted in a significant jump in the specific energy requirements after Year 4. The following Figure 5.7 shows the initial Hard / Soft interface assumption.

By applying the specific energy at each comminution sample location a more representative hardness profile was generated. To generate these values, the SPE75 values for samples tested by OMC were coded into the resource block model, based on their spatial location deposit. The coding was carried out using a simple nearest neighbour technique, so there no transition between zones of hardness. The block model was then run through the mine schedule process and the values were output (along with the processing schedule) for each time period on a tonnes weighted average basis. The result is shown in the following Figure 5.8.

Although the comminution data is relatively sparse and the profile should be treated with caution, it does show that the specific energy excursions are not as extreme as initially anticipated. Based on this data a future expansion was not justified and the initial SAG mill was sized to cope with the LOM hardness profile, realising the initial excess capacity. Hence the circuit has the capacity to treat 1.7 Mtpa for the first four years of production.

Figure 5.7 Original 'Hardness'

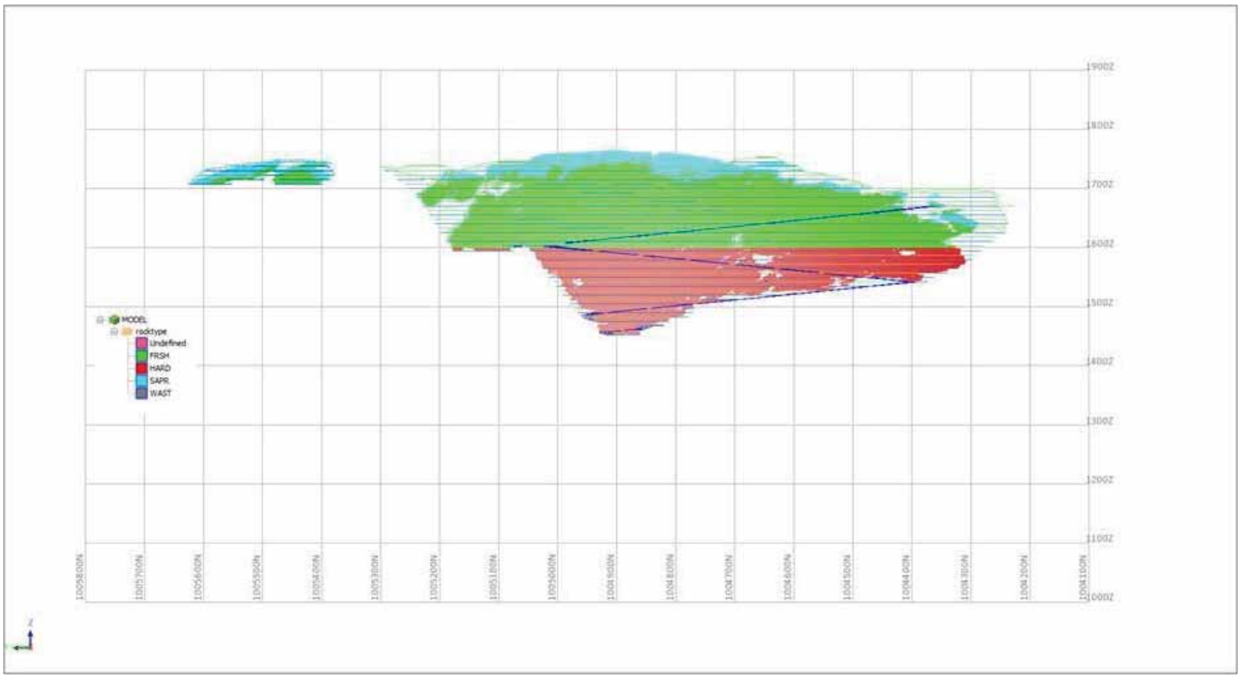
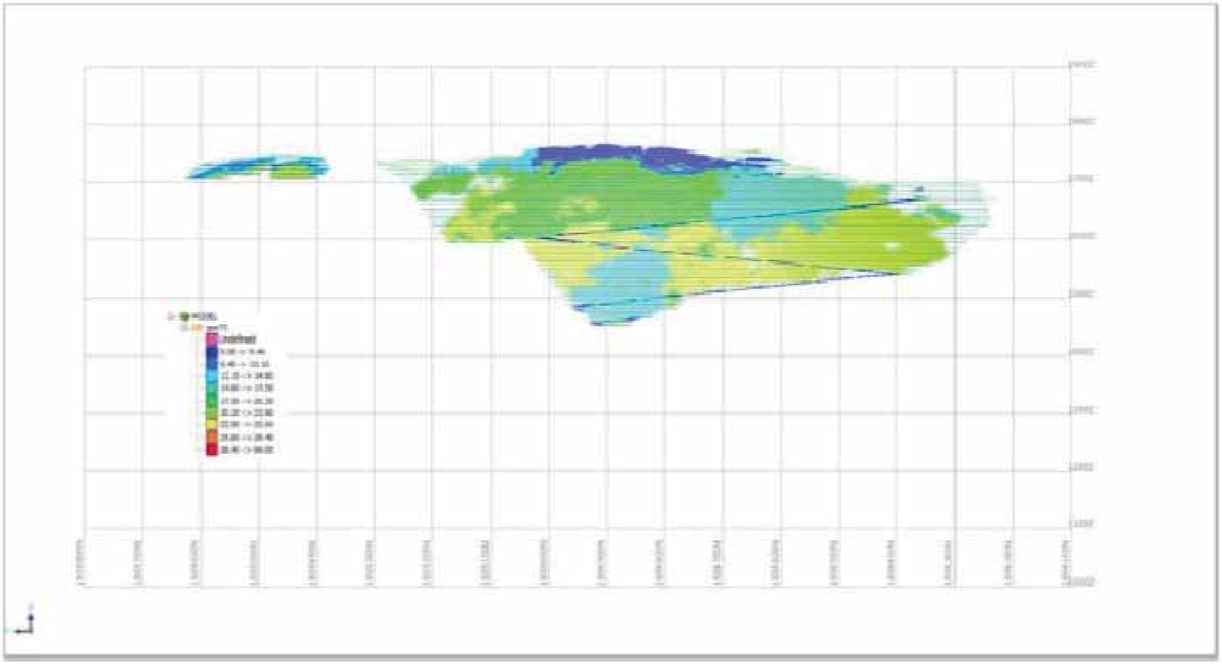


Figure 5.8 Updated 'Hardness' Model



6.0 PROCESS PLANT DESIGN

6.1 Process Design

6.1.1 Design Philosophy

The proposed process plant design for the Tulu Kapi Gold Project is based on a robust metallurgical flowsheet designed for optimum recovery with minimum operating costs. The flowsheet is constructed from unit operations that are well proven in industry.

The key criteria for equipment selection are the suitability for duty over the life of the operation, reliability and ease of maintenance. The plant layout will provide ease of access to all equipment for operating and maintenance requirements while maintaining a compact footprint to minimise construction costs.

The Tulu Kapi plant will process a range of ore types (oxide, shallow / soft fresh and deep / hard fresh ores) with variable ore characteristics, gold grades and metallurgical treatment requirements. The fresh ores are harder and more competent and will be processed at a lower throughput rate.

KEFI has advised that ores will be mined so that predominantly oxide / shallow / soft fresh ore will be processed for the first 3 years, and thereafter a mixture of shallow and hard fresh ore will be processed. Oxide ore will be processed at a rate of up to 1.7 Mt/y, while fresh ore will be processed at a rate of 1.5 Mt/y using a single stage crushing and single stage SAG mill circuit.

The key project and ore specific design criteria that the plant design must meet are aligned with the process performance guarantees for:

- Fresh and oxide ore throughput.
- Milled product P_{80} grind size.
- Soluble gold loss to CIL tails.
- Elution efficiency.
- Weak acid dissociable (WAD) cyanide discharge concentration to the TSF.

A process design criteria (1953-000-PRPDC-0001) document has been prepared incorporating the engineering and key metallurgical design criteria derived from KEFI advice, the results of metallurgical testwork and comminution circuit modelling. The process design document is included in Appendix 6.1 and forms the basis for the process and engineering design of the processing plant and required site services.

6.1.2 Selected Process Flowsheet

The treatment plant design incorporates the following unit process operations:

- Single stage crushing with a vibrating grizzly feeding an open circuit jaw crusher.
- A crushed ore surge bin. Surge bin overflow will be conveyed to a dead stockpile. Ore from the dead stockpile will be reclaimed by front end loader (FEL) (by mining contractor) to feed the mill during periods when the crushing circuit is off-line.
- A single stage semi autogenous grinding (SAG) mill in closed circuit with hydrocyclones.
- A carbon-in-leach (CIL) circuit incorporating six CIL tanks containing carbon for gold adsorption.
- A pressure Zadra elution circuit including electrowinning and gold smelting to recover gold from the loaded carbon to produce doré. Eluted carbon will be regenerated in a horizontal kiln.
- Cyanide destruction using the SO_2 / air process to produce an effluent weak acid dissociable (WAD) cyanide concentration of <50 ppm.
- Tailings pumping to and decant recovery from the tailings storage facility (TSF – by others).
- Air and water services as required.
- Reagent make-up, storage and distribution facilities.

A simplified flow diagram depicting the unit operations incorporated in the selected process flowsheet is shown in flowsheet 110-PRPFD-0002 included in Appendix 6.3.

The selected flowsheet has a number of changes from the 2015 DFS, specifically:

- Processing of up to 1.7 Mtpa of less competent ore with a nameplate throughput of 1.5 Mtpa. The 2015 DFS plant design throughput was 1.2 Mtpa.
- Replacement of the live coarse ore stockpile and reclaim feeders with a surge bin and “dead” stockpile. The SAG mill feed will be withdrawn directly from the surge bin, thereby addressing oxide handling issues through the stockpile. The bin will be equipped with a tipping ramp to allow reclaim from the stockpile during periods of crusher downtime.
- The adoption of a coarser P_{80} grind size (150 μm instead of 75 μm) allowed selection of a single stage SAG mill in place of the proposed SAG / ball milling circuit. Reinterpretation of the ore hardness profile in line with the mining schedule implied no need for the proposed stage two addition of secondary crushing and screening of the mill feed. The single stage SAG mill will be fitted with a VSD to allow turndown during periods of low competency ore feed.

- The elution circuit capacity increases from 4 t to 6 t with the higher throughput. KEFI requested a change to a diesel fired heater and kiln rather than electric for improved operability and reduced maintenance.

- Quicklime dosed via the mill feed conveyor will be used in place of a hydrated lime system with wet make-up and distribution network.

- KEFI requested additional changes for the purpose of capital reduction (e.g. removal of tower crane and inclusion of a gantry crane arrangement, relocation of Administration and Mine building).

6.1.3 Plant Design Basis

The key issues considered for the process and equipment selection are outlined in this section.

Process Plant

The plant design has been based on a nominal capacity of 1.7 Mt/y of oxide ore or 1.5 Mt/y fresh ore.

ROM Pad

The ROM pad will be used to provide a buffer between the mine and the plant. The ROM stockpile will allow blending of feed stocks and ensure a consistent feed type and rate to the plant. A mobile rock breaker (by the mining contractor) will be used to break oversize rocks on the ROM pad.

The battery limit for the process plant supply and operation is feed ore delivered to the ROM bin.

Comminution Circuit Selection

Comminution data was provided to Orway Mineral Consultants (OMC) for comminution circuit modelling and mill sizing. Details of the OMC work are summarised below with full details in the OMC report 7743, July 2016 included in Appendix 6.6.

Comminution Circuit Design Basis

The Tulu Kapi ores have variable comminution characteristics but can be classified into two main groups:

- Oxides ores with typically low competency and below average grinding energy requirements and slight to moderate abrasivity.

- Fresh ores exhibiting higher competency and grinding energy requirements and which are moderately abrasive.

The Tulu Kapi mine schedule produces predominantly oxide and shallow fresh ores during the early years of operation with increasing fractions of harder fresh ores thereafter. A variable speed drive has been specified for the SAG mill to address the variability in feed ore types and blends.

The key design criteria used for modelling the comminution circuit and details of the mill size and operating parameters are summarised in Table 6.1.

6.1.4 Selected Comminution Circuit

Crushing Circuit

The crushing circuit has been sized for a feed rate 30% above that of the fresh ore milling throughput, so that crusher downtime for maintenance does not affect overall mill operating time. Excess crushed ore will be stockpiled and reclaimed via the crushed ore surge bin during periods of crusher downtime to provide constant feed to the mill.

A fixed grizzly will be installed on the ROM bin to minimise oversize material entering the bin and causing down-stream blockages.

A variable speed apron feeder will withdraw ore from the base of the ROM bin and feed a vibrating grizzly. Vibrating grizzly oversize will be directed to the jaw crusher and undersize will report directly to the crusher discharge conveyor, bypassing the jaw crusher and thereby reducing the load and wear on the jaw crusher.

Occasional dozing of the crushed ore stockpile (by the mining contractor) will be required, using the mine equipment, to create additional storage capacity.

Table 6.1 Summary of Comminution Indices and Selected Milling Circuit Design

Parameters	Condition	Units	Value
CWi		kWh/t	8.2 – 12.9
BWi		kWh/t	15.5 – 18.0
RWi		kWh/t	11.3 – 19.7
Axb		-	112 - 39
Milling Feed F_{80}		mm	122
Milling Product P_{80} (fresh ore)		µm	150
Mill Specific Energy (fresh ore)	@ P_{80} 150µm	kWh/t	17.7
Mill Pinion Power (fresh ore)	Nominal	kW	3320
Grinding Circuit Throughput	Nominal	t/h	188 - 213
	Nominal	Mt/y	1.5 – 1.7
Mill Pinion Power	Nominal Max	kW	4370
Mill Installed Power		kW	4500
Mill Diameter		m	6.7
Mill EGL		m	6.2
Mill Dia x EGL		ft x ft	22 x 20.3
L:D Ratio			0.93
Discharge Arrangement			Grate
Speed	Nominal	% Nc	75
	Range	% Nc	60 - 80
Liner Thickness	New	mm	100
Milling Density		% solids	75
Ball Charge	Nominal	% vol	11
	Maximum	% vol	16
Total Load	Nominal	% vol	25
	Maximum	% vol	35
Pinion Power	Nominal	kW	3320
	Maximum	kW	4370
Installed Power		kW	4500

Note: SAG mill motor sized for 80% Nc, 16% ball charge, 35% mill load.

Milling and Classification

A single stage SAG milling circuit has been selected to grind crushed product to the nominated circuit P_{80} size.

The SAG mill will be configured as a grate discharge mill. The mill will be equipped with a variable speed drive. Pebble crushing is not included or required, but space will be made available in the layout to install a pebble crusher in the future if required.

The classification cyclones will be operated at a moderate overflow density to provide a slurry solids concentration suitable for CIL leaching. The cyclone overflow will report to CIL via the trash screen. As a result, pre-leach thickening is not required.

Leach and Adsorption Circuit

Metallurgical testwork indicated that:

- the Tulu Kapi ores show mild 'preg-robbing' characteristics
- the tested leach kinetics for both the oxide and fresh ores indicate that the majority of gold will be leached within 24 hours.

On this basis, a circuit configuration comprising six leach tanks with carbon in all stages (CIL) to recover the dissolved gold has been selected. Six CIL stages will achieve acceptable stage efficiencies and target solution tails grades. The tanks will be identical in size with cyanide added to the first CIL tank and to subsequent CIL tanks as required. Air will be sparged to all tanks to oxygenate the slurry and to maintain adequate dissolved oxygen levels for leaching in the CIL tanks.

Elution

The average daily movement of carbon has been calculated based on the design feed grade and maximum CIL gold extraction.

Cyanide Destruction

An SO_2 / Air cyanide destruction step on the CIL tailings will be provided to detoxify CIL tailings to a nominal CN_{WAD} level of <50 ppm. Two cyanide destruction reactors with the facility to operate in series or parallel have been included to provide a robust and flexible treatment scheme. While it is not expected that pH adjustment of the reactor products will be required, the ability to dose caustic soda will be provided to enable pH control if required.

Water Supply

Water for the project will be collected from rainfall and associated surface runoff and stored in a raw water diversion dam (by others). Raw water from the dam will be pumped to the plant raw water storage tank to provide raw water services. The dam supply will also be used for process water make-up.

TSF decant return water will be recycled to the process water tank.

6.2 Process and Plant Description

The process and plant description should be read in conjunction with the process plant flowsheets provided in Appendix 6.3 and the process plant general arrangement drawings provided in Appendix 6.5. The mechanical equipment list and the electrical load list are also appended in Appendices 6.2 and 6.4, respectively.

6.2.1 Run-of-Mine (ROM) Pad

Haul trucks operating directly from the pit will deliver ROM ore to the ROM pad where it will either be dumped in blending 'finger' stockpiles arranged by ore gold grade and lithology or dumped directly into the ROM bin to feed the crusher. A FEL will be used to reclaim and tram ore from the various stockpiles to the ROM bin. Ore will be blended under the guidance of mine geologists and process personnel to maintain a relatively constant feed blend to the process plant.

6.2.2 Crushing Circuit

A static grizzly fitted to the ROM bin will protect the downstream equipment from oversize material and minimise the likelihood of chute blockages. A mobile rock breaker (by mining contractor) will be utilised to break oversize rocks as required.

ROM ore will be drawn from the ROM bin at a controlled rate by a variable speed apron feeder to feed a vibrating grizzly feeder. The grizzly oversize will report to the jaw crusher. The grizzly undersize and jaw crusher discharge will gravitate to the primary crushing discharge conveyor (CV-01) which will feed the surge bin. A weightometer on CV-01 will indicate the instantaneous and totalised primary crushing tonnage.

Water sprays will be installed for dust suppression at the tip bin. Raw water will supply the sprays to ensure no cyanide carryover to uncontaminated areas.

The crushing circuit will be controlled to an operator input feed setpoint. The ROM pad FEL driver will ensure feed is maintained to the crushing circuit and will communicate with the crushing operator using a two way radio to supply information on crusher feed operation. The speed of the apron feeder will be adjusted by the crushing operator as required.

If the jaw crusher is shut down or there is a shortfall in feed from the ROM pad, the ROM pad FEL will move to reclaim crushed ore from the crushed ore stockpile to feed the mill via the surge bin.

Coarse spillage in the primary crushing area will be cleaned up by a FEL / bobcat and loaded into the circuit via the ROM bin / surge bin depending on size. Wet spillage from the crushing area will gravitate to non-cyanide site drainage via a sediment control pond.

6.2.3 Ore Storage and Reclaim

Under normal operating conditions, the crushing rate into the surge bin will exceed the rate of withdrawal of ore to the milling circuit. Excess crushed ore will overflow the surge bin and be directed onto the conveyor feeding the crushed ore stockpile (CV-02).

Crushed mill feed will be withdrawn from the surge bin at a controlled rate by a variable speed apron feeder and fed via the mill feed conveyor (CV-03) directly to the SAG mill. A weightometer on CV-03 will indicate the instantaneous and totalised mill feed tonnage.

SAG mill grinding media will be charged via the surge bin by a FEL.

Quicklime, used for pH control in the leach circuit, will be added directly onto CV-03. Quicklime will be stored in a lime silo and will be metered onto the belt using a bin activator and a variable speed rotary feeder. The speed of the rotary feeder will be varied according to the mill feed tonnage. The operation of the bin activator will be controlled such that the activator will not run if the rotary valve is stopped. Quicklime will be delivered to site in bulk bags and transferred to the lime silo using a hoist and lifting frame to a bag breaker mounted at the top of the storage silo. The silo will be fitted with a dust collector.

Water sprays will be installed for dust suppression at the surge bin and crushed ore stockpile. Raw water will supply the sprays.

Coarse spillage in the surge bin area will be cleaned up by a FEL / bobcat and loaded into the circuit via the surge bin. Wet spillage from the surge bin area will gravitate to site drainage via a sediment control pond.

The reclaim circuit will be controlled to maintain an operator input mill feed rate setpoint and lime addition rate from the main control room. Area shift operators will also monitor operations in the field.

6.2.4 Grinding and Classification Circuit

The grinding circuit will consist of a single stage SAG mill in closed circuit with hydrocyclones. Crushed ore will be fed directly to the SAG mill. Process water will be added to the SAG mill to achieve the required milling density.

The SAG mill will discharge via a trommel into the mill discharge hopper. The slurry will be diluted with process water and pumped to the classifying hydrocyclone (cyclone) cluster for classification. Duty / standby cyclone feed pumps will be provided to facilitate maintenance with minimum disruption to mill operation to ensure high operating availability. SAG mill scats (trommel oversize) will discharge to the scats bunker and will be periodically removed by a bobcat / FEL for recycling via the surge bin.

The cyclone underflows will be collected in the underflow launder and gravitate to the SAG mill feed spout. The combined overflow stream will gravitate to the trash screen.

Cyclone overflow will be screened on a vibrating trash screen to remove any misreporting coarse ore particles, wood fragments, organic material and plastics that may become locked in the carbon circuit and 'peg' the intertank screens. The trash will report to a bin for periodic removal and disposal.

Mill load and power will be monitored to guide adjustments to mill feed, speed and other operating parameters. No higher level optimising control package has been allowed. Grinding media will be added into the SAG mill via the surge bin to assist with managing power draw.

Allowance will be made for future addition of a mill liner handler and a recoilless liner bolt removal hydraulic hammer.

The number of operating cyclones will be remotely managed to match the mill circulating load with changes in mill feed grindability. Three of the operating cyclones will be fitted with remotely actuated pneumatic inlet valves to cater for normal perturbations to the circuit operation. Major changes in circulating load or target cut-point may require changes to the base number of operating cyclones (manual valve opening). Provision for 20% spare cyclones in the cluster has been made to facilitate on-line maintenance and increased operating flexibility.

The cyclone / trash screen platform will be serviced by a davit crane.

Mill area spillage will report to a drive-in sump to allow dewatering by a sump pump with coarse spillage reclaim by FEL and recycle via the surge bin. A manual hoist will be provided to raise and lower the sump pump depending on the depth of spillage in the sump.

6.2.5 Leach and Carbon Adsorption Circuit

The trash screen underflow stream will gravitate to the CIL feed distribution box. The circuit will consist of six tanks interconnected with launders and slurry will flow by gravity through the tank train. The six tanks will operate as CIL tanks for leaching and gold adsorption onto the activated carbon.

Each tank will be fitted with a dual impeller, mechanical agitator to ensure uniform mixing and a mechanically swept woven wire intertank screen to retain the carbon. All tank launders will have bypass facilities to allow any tank to be removed from service for agitator or screen maintenance.

Quicklime added directly to the mill feed conveyor will ensure that the slurry pH is suitable for cyanidation. Sodium cyanide solution will be metered into the CIL feed distribution box with provision for staged addition to tanks 1 - 3 from a ring main system. Blower air will be distributed to all tanks and sparged down the agitator shafts to oxidise potential cyanicides and to provide dissolved oxygen for the gold dissolution reaction.

Fresh / regenerated carbon will be returned to the circuit at CIL Tank 6 and will be advanced counter current to the slurry flow by pumping slurry and carbon from CIL Tank 6 to CIL Tank 5 and so on. The intertank screen in CIL Tank 5 will retain the carbon whilst allowing the slurry to flow by gravity back to Tank 6. This counter-current process will be repeated until the carbon eventually reaches CIL Tank 1, the first adsorption tank. A recessed impeller pump will be used to transfer slurry to the loaded carbon recovery screen mounted above the acid wash column in the elution circuit. The carbon will be washed and dewatered on the recovery screen prior to reporting to the acid wash column. The associated slurry and wash water will return to CIL Tank 1.

Slurry from the last CIL tank (CIL tails) will gravitate to the carbon safety screen to recover any carbon leaking through worn screens or overflowing the tanks. Screen underflow will gravitate to the cyanide destruction feed box. Safety screen oversize (recovered carbon) will be collected in the fine carbon bin for potential return to the circuit.

Regenerated carbon returning to the adsorption circuit (CIL Tanks 5 or 6) from the carbon regeneration kiln will be screened on the carbon sizing screen to remove fine carbon and quench water. The sizing screen underflow containing carbon fines will report directly to the safety screen. Barren eluted carbon (bypassing regeneration) will report directly to CIL Tank 6.

Sump pumps at the head and tail ends of the CIL train in accessible positions adjacent to the bund wall will be used to manage any spillage from the tanks. The CIL bund floor will slope to each of these sump positions. The CIL containment bund will cater for spillage and splash, but will not be designed to hold the full volume of a tank; any significant overflows will report to the tails storage facility (via concrete trench to plant fence, then earthen trench and gravity into the TSF).

An overhead gantry crane will allow maintenance of the agitators, intertank screens and carbon transfer pumps. A spare intertank screen and maintenance bay will be provided to allow screen change-out to minimise the time for which a tank will be off-line.

The plant control room will be mounted above the CIL tanks in a central location from which most of the operations can be observed. All CIL control will be manual with a titration and sample preparation facility to allow monitoring of cyanide level and carbon concentration. Shift composite samples of CIL feed and tails will be prepared for laboratory assays.

6.2.6 Elution and Goldroom Operations

The following operations will be carried out in the elution and goldroom areas:

- Acid washing of carbon.
- Stripping of gold from loaded carbon using the Zadra method.
- Electrowinning of gold from pregnant solution.
- Smelting of electrowinning products.

The elution and goldroom areas can operate seven days per week, if required, with the majority of loaded carbon preparation and stripping occurring during day shift.

Acid Wash

Loaded carbon will be recovered on the loaded carbon recovery screen and directed to the rubber lined acid wash column. Transfer and fill operations will be controlled manually. The balance of the acid wash and the pumping sequence will be manually initiated based on timer signals.

The operator will start the acid washing sequence once the column has been filled with carbon. The acid wash solution, 3% w/w HCl in raw water, will be prepared prior to use and stored in the acid mixing / storage tank.

During acid washing the dilute solution of hydrochloric acid will be pumped into the column in an up-flow direction. After an acid soak period to remove contaminants, predominantly carbonates, from the loaded carbon, the carbon bed will be rinsed with raw water to displace any residual acid. This process improves the elution efficiency and has the beneficial effect of reducing the risk of calcium-magnesium 'slagging' within the carbon during the regeneration process.

Dilute acid and rinse water will be directed to the tailings hopper for disposal to the TSF. Acid-washed carbon will be transferred to the elution column for stripping.

The acid wash column will have a partitioned area of the elution area bund, separated such that the acidic spillage cannot mix with cyanide solutions and will be separately disposed of by a dedicated sump pump.

Elution and Electrowinning

Sodium hydroxide and sodium cyanide will be metered into the strip solution tank and the tank filled with raw water. The strip solution will then be pumped through a recuperative heat exchanger and a diesel fired solution heater package before entering the base of the elution column.

The recuperative heat exchanger recovers heat from the return eluate and preheats the incoming barren strip solution. The diesel fired solution heater package raises the temperature of the incoming strip solution to approximately 120°C. A local vendor control package will control the heater firing to maintain the solution temperature.

The heated strip solution will flow upwards, in a plug flow regime, through the bed eluting gold and silver from the loaded carbon. The pregnant solution exiting the top of the column will be cooled through the recuperative heat exchanger and in the process pre-heating the incoming barren strip solution.

The pregnant solution will be further cooled by flashing it off at atmospheric pressure to allow electrowinning. Two electrowinning cells operating in parallel will be provided to ensure appropriate linear velocities through the cells. Direct current will be passed through stainless steel anodes and stainless steel mesh cathodes within the electrowinning cell and electrolytic action will cause gold in solution to form a gold rich sludge on the cathodes. The cells will contain sufficient cathodes in order to provide a high cell pass efficiency to minimise the gold tenor in the spent electrolyte returning to the strip solution tank. The elution / electrowinning cycle will continue until the solution exiting the elution column is depleted of gold and silver values.

A sulphamic acid pump will be provided to allow periodic flushing of the heat exchangers to reduce the scaling of the surfaces and maintain heat transfer efficiencies.

Goldroom

The electroplated silver and gold sludge will be removed from the cathodes by washing with high pressure water jets. The resulting slurry will be filtered in a vacuum filter with the recovered solids being dried in an oven. The sludge will then be direct smelted with fluxes in a diesel-fired furnace to produce doré bars. Slag from smelting operations will be returned to the milling circuit.

Fume extraction equipment will be provided to remove gases from the electrowinning cells, oven and barring furnace.

The goldroom building will be located inside a secure area with restricted access by authorised personnel and vehicles only. The security area will have separate personnel and vehicle access doors. Remote CCTV monitoring of goldroom activities will be in place. The building will be fresh air ventilated to maintain acceptable working temperatures.

The electrowinning cells will be located on the upper level to permit gravity solution return to the strip solution tank and sludge draining. The cells and anode support frame will be serviced by a monorail hoist. The electrowinning cell rectifiers will be located outside the goldroom building to allow monitoring of the current and voltage settings.

Carbon Regeneration

After completion of the elution process, the barren carbon will be transferred from the elution column to the carbon dewatering screen to dewater the carbon prior to entering the feed hopper of the horizontal carbon regeneration kiln. In the kiln feed hopper any residual and interstitial water will be drained from the carbon before it enters the kiln. Kiln off-gases will also be used to dry the carbon prior to entering the kiln.

The carbon will be heated to 650 - 750°C in the kiln and held at this temperature to allow regeneration to occur. Regenerated carbon from the kiln will be quenched and transferred to the carbon sizing screen. Carbon sizing screen oversize (regenerated, sized carbon) will return to the CIL circuit and screen undersize (transfer water containing some fine carbon) will gravitate to the carbon safety screen for disposal of the fine carbon in the TSF.

The carbon regeneration kiln will be located at the top of tank level. A local vendor control panel will monitor the kiln status and control the retort temperature to the target set point.

Fresh carbon will be loaded into the quench tank using the CIL gantry crane.

6.2.7 Cyanide Destruction

CIL tails will gravity flow via the carbon safety screen to the cyanide destruction feed box. The cyanide destruction feed box will also accept flows from other plant streams directed to tailings including acid rinse, acid area sump pump discharge, and plant laboratory cyanide wastes. The CIL tails stream will be designed to allow flow through two equally sized cyanide destruction reactors in either series or parallel. Sodium metabisulphite (SMBS) and copper sulphate solutions will be dosed in a controlled manner, based on the measured incoming WAD cyanide levels.

Low pressure blower air will be sparged into the bottom of each tank. The cyanide destruction reactors have been sized to allow a one hour residence time at the design CIL tailings slurry flow rate to oxidise the incoming WAD cyanide to cyanate. The ability to dose the reaction tanks with caustic soda for pH control will be provided, although it is not expected that this will be required under normal operation.

6.2.8 Tails Disposal

Cyanide destruction discharge will flow by gravity from the cyanide destruction discharge reactors to the cyanide destruction discharge pump hopper for pumping of the tailings to the TSF.

A sump pump will service the cyanide destruction / tails pumping area. Spillage will be returned to the cyanide destruction feed box.

Tailings will be deposited into the TSF.

6.2.9 Decant Return

Supernatant water will be recovered from the TSF using a pontoon mounted pump and returned for reuse in the plant.

6.2.10 Reagents

Quicklime

Quicklime will be delivered to site in one tonne bulk bags. Quicklime will be added to the mill quicklime storage silo using an electric hoist and enclosed bag breaker. Quicklime will be metered via a rotary valve directly onto the mill feed conveyor for circuit pH control. A dust collector will minimise dust emissions during loading of quicklime into the storage silo.

Cyanide

Cyanide will be delivered to site in one tonne boxes containing bulka bags of cyanide briquettes. Cyanide briquettes will be added to the cyanide mixing tank using an electric hoist and enclosed bag breaker and dissolved in process water to achieve the required solution strength of 20% w/v.

The cyanide solution will be transferred to the storage tank for use in the process. Cyanide will be reticulated to the CIL circuit via a ring main and dosed to the CIL tanks as required. A dedicated pump will provide cyanide solution to the elution circuit.

Caustic Soda

Caustic soda (sodium hydroxide) will be delivered to site in 25 kg bags of 'pearl' pellets. Caustic bags will be added by hand to the mixing tank via a bag breaker on the receiving hopper. The pellets will be discharged into the mixing tank via a manual rotary vane feeder to prevent splash back from the tank and dissolved in raw water to the required solution strength.

The caustic solution will be dosed into the elution circuit and to the cyanide destruction circuit as required.

Hydrochloric Acid

Concentrated hydrochloric acid (32% w/w) will be delivered to site in 1,000 L isotainers. The concentrated hydrochloric acid will be pumped into the acid mixing / storage tank where it will be diluted with the correct quantity of raw water to achieve the required acid wash concentration.

The dilute acid solution will be pumped to the elution circuit as required.

Sodium Metabisulphite (SMBS)

SMBS will be delivered to site in 1 tonne bulk bags of solid flake. These will be added to the SMBS mixing tank using an electric hoist and enclosed bag breaker and dissolved in raw water to achieve the required solution strength of 20% w/v. The mixed solution will be transferred to the SMBS stock tank via a transfer pump.

A ventilation fan will be provided to prevent the build-up of SO_2 gas in the tanks.

Copper Sulphate

Copper sulphate will be delivered to site in 25 kg bags. Copper sulphate bags will be added by hand to the mixing tank via a bag breaker on the receiving hopper and dissolved in raw water to the required solution strength.

Activated Carbon

Activated carbon will be delivered to site in 500 kg bulk bags. Carbon will be added directly to the last adsorption tank, as required for carbon make-up.

Grinding Media

Grinding balls will be delivered to site in 200 L steel drums. Balls will be charged to the SAG mill as required via the surge bin.

Diesel

Diesel will be delivered to site by bulk tankers and transferred to the diesel storage tank. Diesel will be pumped from the storage tank to the plant day tank for use in the strip solution heater, carbon regeneration kiln and smelting furnace. A header tank will feed the burners for the noted equipment to ensure the correct inlet pressure.

Reagents Storage

Reagents will be received on site in shipping containers, with a minimum of three months' capacity stored on site to ensure that supply interruptions due to port, transport or weather delays do not impact production. Reagent containers will be offloaded from the delivery truck by the site crane and unloaded into the designated storage areas or stacked in a lay-down area until required. Empty containers will be returned with the next delivery. A partitioned undercover reagent storage area will be provided for storage of unpacked reagents.

6.2.11 Services

Raw Water

Water will be pumped via a pontoon mounted pump from the raw water diversion dam to the plant raw water tank. The raw water tank will have sufficient capacity to minimise the impact of short term supply interruptions. Duty / stand-by water pumps will be provided for the raw water distribution in the plant.

Fire Water

Fire water for the process plant will be drawn from the raw water tank. Suctions for other water services fed from the raw water tank will be at an elevated level to ensure a fire water reserve always remains in the raw water tank.

The fire water pumping system will contain:

- an electric jockey pump to maintain fire ring main pressure
- an electric fire water delivery pump to supply fire water at the required pressure and flowrate
- a diesel driven fire water pump that will automatically start in the event that power is not available for the electric fire water pump or that the electric pump fails to maintain pressure in the fire water system.

Fire hydrants and hose reels will be placed throughout the process plant and plant offices at intervals that ensure complete coverage in areas where flammable materials are present.

Gland Water

Water from the raw water storage tank will be distributed as gland service water using duty / stand-by gland water pumps.

Process Water

Water will be pumped via pontoon mounted pump from the TSF to the plant process water tank. The plant process water will consist of TSF decant return water and raw water make-up. Duty / standby process water pumps will be provided for the plant process water supply.

Potable Water

Raw water will be supplied to the plant potable water treatment plant for treatment. Potable water will be stored in the plant potable water tank and will be reticulated to the site ablutions, safety showers and other potable water outlets.

Plant and Instrument Air Supply

Plant and instrument air will be supplied from duty / standby air compressors. The air will be filtered and dried before distribution with separate plant and instrument air receivers. A check valve on the instrument air supply will ensure the integrity of instrument air supply such that air from the plant air system serves as a back-up for instrument air, but plant air cannot draw down the instrument air system.

Blower Air

Low pressure air blowers will supply the CIL tank leach and the cyanide destruction reactor oxygen requirements.

6.3 Metallurgical Accounting

Weightometers will be located on the following conveyors:

- Surge bin feed conveyor will measure crushed ore tonnage.
- Mill feed conveyor will measure mill feed tonnes.

The tonnage of crushed ore reporting to the dead stockpile can be estimated from the difference between the crushed ore tonnage and the mill feed tonnes.

Routine manual sampling of the solids and solution from the leach feed stream and the final leach tails will ensure reliable composite shift samples for leach head grade and tails solution and residue grades.

Density and flowmeters on the leach feed and tailings lines will allow the dry tonnage of solids pumped to the CIL and TSF to be determined as a cross check on the mill feed tonnage determined from the mill feed weightometer. In conjunction with the leach feed and tails samples, the mass flow measurements will allow the gold recovered in the CIL to be calculated.

Regular gold 'in circuit' surveys will allow reconciliation of precious metals in feed compared to doré production.

Water supplied and used in the various areas will be continuously monitored.

Reconciliation of the amount of reagents used over relatively long periods will be achieved by delivery receipts and stock takes. On an instantaneous basis, reagent usage rates of cyanide and elution reagents and diesel flow rates to unit operations will be measured (L/min) and accumulated (m^3) using flowmeters.

6.4 Process Design Criteria

Refer to Appendix 6.1 Process Design Criteria.

6.5 Mechanical Equipment List

Refer to Appendix 6.2 Equipment List.

6.6 Process Flow Diagrams (PFDs)

Refer to Appendix 6.3 Process Flow Diagrams (PFDs).

6.7 Electrical Load List

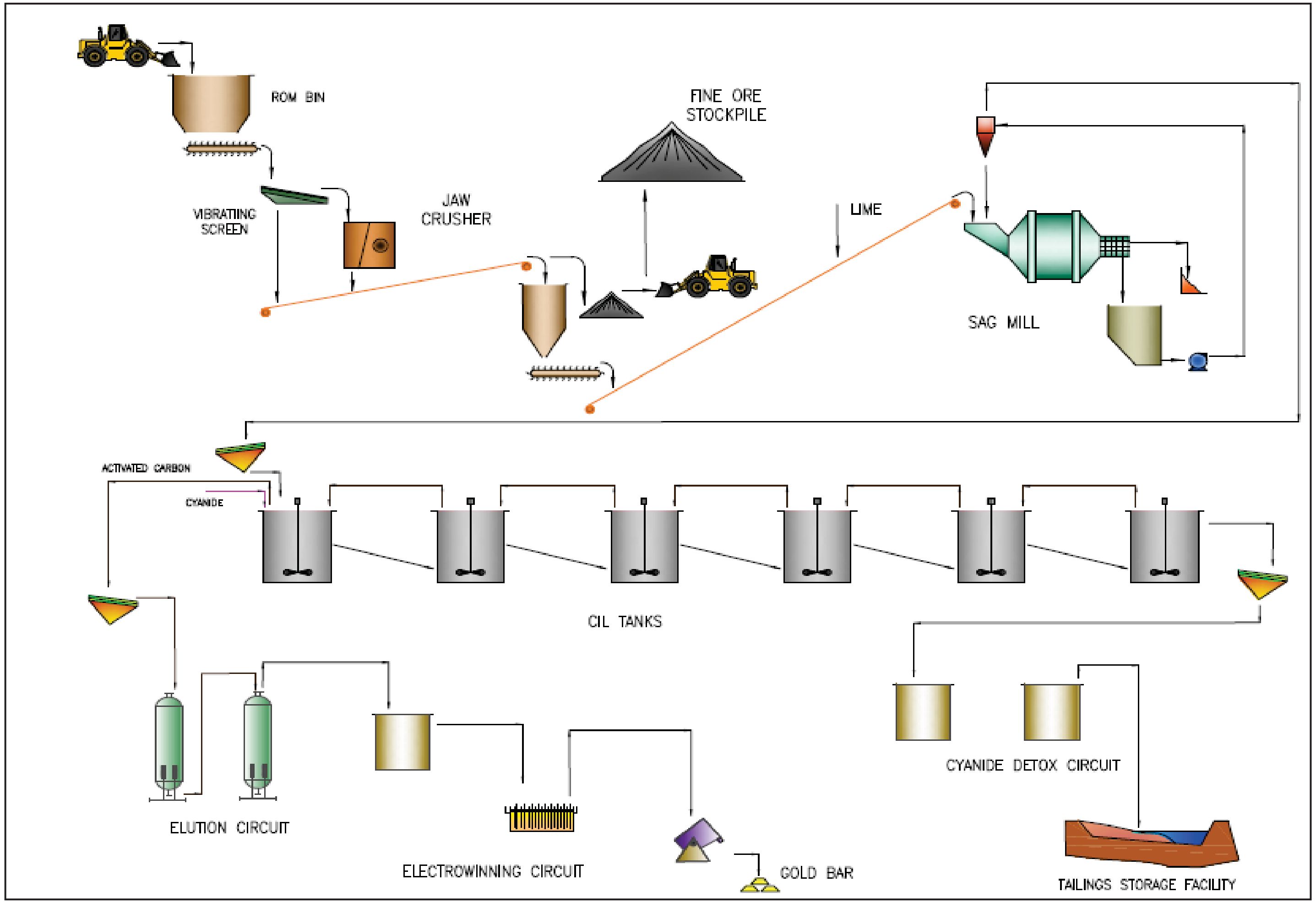
Refer to Appendix 6.4 Electrical Load List.

6.8 Site General Layout

Refer to Appendix 6. 5 Site General Layout.

6.9 Process Flow Diagrams

Figure 6.1 Simplified Process Flowsheet



7.0 TAILINGS STORAGE FACILITY AND WATER DAMS

7.1 Introduction

Epoch Resources (Pty) Ltd ('Epoch') were appointed for the 2015 DFS to compile an addendum to the 2012 DFS design of the Tailings Storage Facility (TSF). Subsequent to the 2015 DFS, KEFI engaged Increva Pty Ltd to investigate and provide an indicative estimate for an optimised TSF and Water Dam infrastructure design.

Included in the scope for this report, Lycopodium engaged the services of Knight Piésold in Perth to review the options previously investigated for the TSF and Water Dams, including but not limited to the previous designs of both Epoch and Increva. The outcome of this further investigation concluded that the conceptual design produced by Increva was viable. This was subsequently developed by Knight Piésold in order to provide a costed design for inclusion in this report and revised capital cost estimate.

The design basis and resultant approach adopted for this study update are summarised below.

7.2 Design Criteria and Objectives

7.2.1 Design Objectives

The design objectives for the Tailings Storage Facility (TSF) are as follows:

- Permanent and secure containment of all solid waste materials.
- Maximisation of tailings densities using sub-aerial deposition.
- Removal and reuse of free water.
- Reduction of seepage.
- Containment of design storm events within the TSF.
- Ease of operation.
- Rapid and effective rehabilitation.

The design objectives for the water management and sediment control system are as follows:

- Diversion of rainfall runoff from catchment areas upstream of the TSF, around site infrastructure to discharge offsite downstream of the project.
- Supply of raw water for plant use.
- Reduction of sediment-laden runoff from the site infrastructure using source control measures, to reduce sediment loading.

7.3 Design Criteria

7.3.1 Consequence Category

Population at Risk

Based on the preliminary dam break assessment, the population at risk (PAR) falls in the 1 to 10 category. This is on the lower end of the risk scale.

Severity Level

The severity level for a dam break is assessed as Medium to Major.

Consequence Category

Based on ANCOLD “Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure” May 2012 the consequence category for the facility is rated as ‘High C’.

Based on the Consequence Category the following design criteria were used:

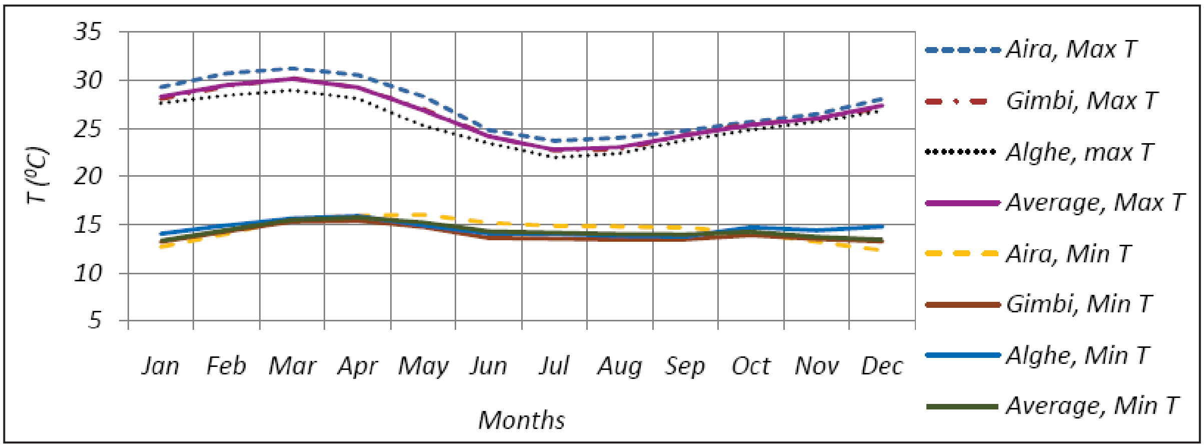
- Extreme Storm Storage Allowance: Maximum of a 1:100 AEP 72 hour or a 1 in 100 Wet Year Sequence.
- Freeboard: 1:10 AEP Wind plus 0.5 m.
- Design Spillway Floods: PMF.
- Earthquake: OBE = 1 in 1,000 yr; MDE = 1:10,000 yr.

7.4 Climate Data

7.4.1 Temperature

The maximum and minimum temperature observations for the three regional stations of Airi, Gimbi and Alghe, which are the most relevant to that which may be observed in Tulu Kapi, are as shown in Figure 7.1.

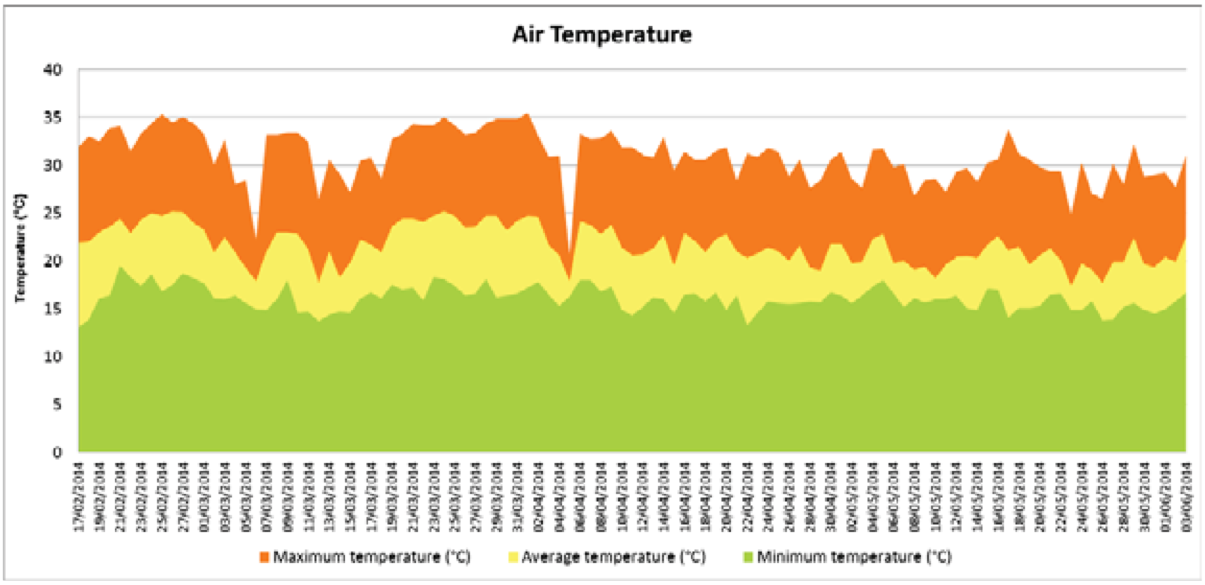
Figure 7.1 Mean Monthly Minimum, Maximum and Average Temperature



Source: SRK Consulting, 2011

Average daily minimum, maximum and average temperatures recorded at the on-site Tulu Kapi Rotunda meteorological station for the period 17 February 2014 to 3 June 2014 are shown in Figure 7.2. Temperature ranges are consistent with the regional conditions, ranging from approximately 15°C to 30°C during this period. The maximum temperature (35.5°C) was recorded on 1 April 2014.

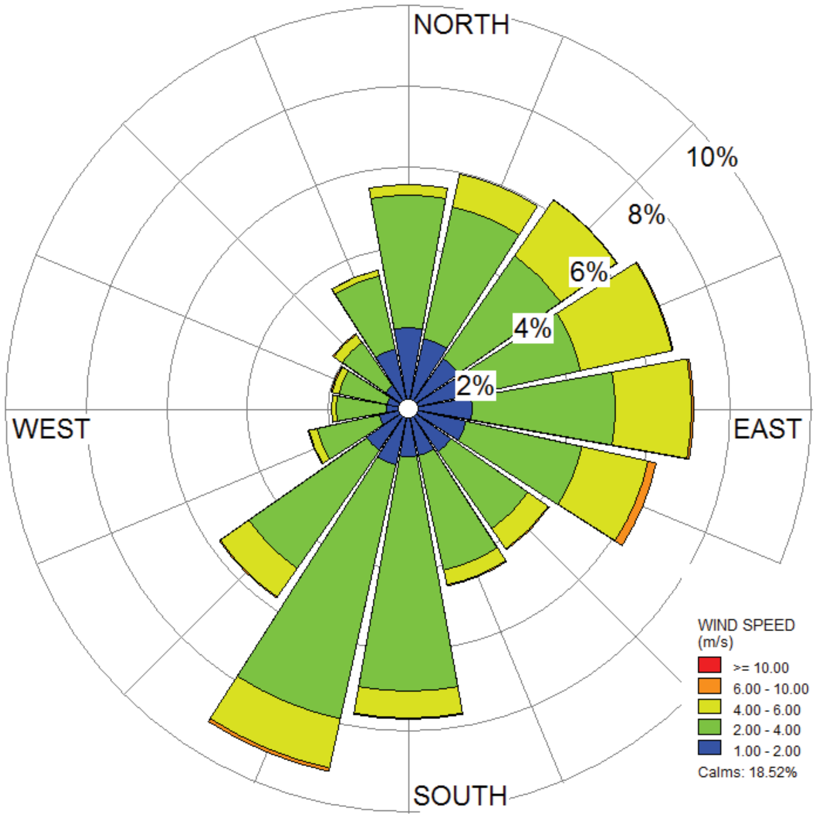
Figure 7.2 Average Daily Minimum, Maximum and Average Temperature



7.4.2 Wind

The wind rose for Tulu Kapi was based on the analysis of the MM5 modelled meteorological for the years 2007 to 2011 (see Figure 7.3). Winds at Tulu Kapi are expected to originate from the south-south-west (9.25% of the time) and south (7.75% of the time). Wind speeds are low, with a high percentage (18.5%) of calm conditions (< 1 m/s).

Figure 7.3 Wind Rose and Wind Frequency Distribution for the Tulu Kapi Site



Diurnal Winds

Between 00:00 to 05:59, winds are predominantly from the south (14% of the time) and south-southwest (10% of the time). During the morning (06:00 to 11:59), winds originate from the east-southeast (12.1% of the time) and east (11.9% of the time). During the afternoon and early evening (12:00 to 17:59), winds originate from the north (13.5% of the time) and north-northeast (12% of the time). During the late evening (18:00 to 23:59), winds largely originate from the south-southwest (13.5% of the time) and north-northeast (9.5% of the time).

Seasonal Winds

During winter (DJF), winds are predominantly from the east-north-east (15% of the time) and east (14% of the time). During spring (MAM), winds are predominantly from the south (10.5% of the time) and south-southeast (8.5% of the time). During summer (JJA), winds are predominantly from the south-southwest (21% of the time) and southwest (15% of the time). During autumn (SON), winds are predominantly from the north-northeast (9% of the time) and equally east and northeast (8% of the time).

7.4.3 Rainfall and Evaporation Data

The climate data used was based on processed rainfall data from Gore and evaporation data from Peens & Associates "Tulu Kapi Tailings Storage Facility Baseline Hydrological Assessment", February 2012. The data are summarised in Table 7.1.

Table 7.1 Monthly Rainfall and Evaporation Data

Month	Rainfall			Evaporation
	Average (mm)	1 in 100 Wet Year (mm)	1 in 100 Dry Year (mm)	(Lake equivalent) (mm)
January	14.3	17.6	19.0	136
February	42.9	2.5	24.8	155
March	42.9	179.0	20.7	156
April	31.8	36.8	14.9	160
May	155.0	314.5	191.3	140
June	275.0	372.2	192.1	104
July	161.4	384.7	104.3	69
August	290.9	380.6	188.0	65
September	275.0	514.4	214.5	71
October	290.1	215.0	136.6	111
November	86.6	297.8	41.4	121
December	29.4	30.1	51.3	131
Total	**1,695.3**	**2,745.2**	**1,198.9**	**1,419**

7.4.4 Storm Data

The storm data analysis was based on daily precipitation data from Gore. After removal of errors and outliers in the data, the storm values as noted in Table 7.2 were applied.

Table 7.2 Storm Events (mm of Rainfall)

Duration	Frequency (Annual Recurrence Interval)				
	10	50	100	500	1,000
6	73	92	101	123	134
12	88	111	122	148	160
24	104	132	144	176	191
72	140	182	200	241	261

For the storm capacity factor in the TSF design, a conservative storm rainfall of 300 mm was used (greater than the 1 in 1,000 years / 72 hour event).

7.5 Geotechnical Conditions

The geotechnical conditions in the TSF and Water Dam (WD) area were assessed based on previous investigations and the following conclusions drawn:

- The scope of work comprised drilling of 6 boreholes to depths of between 12 m and 30 m into bedrock, excavation of 58 test pits, and laboratory testing of selected samples.
- The sub-surface profile within the TSF and WD footprints comprises a variable thickness of laterite and saprolite soils overlying bedrock. Minimal depths of soil overburden were encountered in the valley floors, increasing to upwards of 25 m across the basin areas. The soils comprise red brown or orange brown predominantly medium to high plasticity clayey silt. These soils are firm to stiff becoming stiff to hard in consistency with depth and have low in situ permeability. Bedrock comprises very weak to weak weathered diorite, becoming moderately strong with depth. At the WD site, an intersection of highly weathered, very weak chlorite schist was logged in borehole BH-5-03 between 8.2 m and 13.5 m depth as a sheared contact with a basic dyke.
- Monitoring data indicates that groundwater is located at between 2.4 m and 15 m in the TSF and WD area. Test pit excavations in proximity to watercourses encountered groundwater at a depth of approximately 1.0 m to 1.5 m indicating that near to the valley floors the groundwater level will correspond approximately with creek level.
- Laboratory testing data indicates that the near surface soils should not be susceptible to liquefaction.
- Substantial quantities of borrow material may be sourced from the laterite and saprolite clayey silt horizons which are present beneath the basin areas of both facilities. It is recommended that some depth of low permeability soil cover should be left in place to mitigate potential seepage loss through the upper rock horizons.
- The ground conditions encountered at the proposed TSF and WD embankments should provide competent foundations for the facility embankments.

7.6 Tailings Characteristics

7.6.1 Physical Characteristics

The following tailings characteristics, which are based on prior test work, were assumed for the design:

- Tailings SG 2.8 t/m^3.
- P_{80} 75 microns.
- Slurry % solids 40%.
- Initial Supernatant Release 48%.
- Final Dry Density of Tailings Mass 1.3 t/m^3.

It is recommended that additional testing to determine the physical behaviour characteristics of the tailings is undertaken in the final design phase. (Note: this study update has coarsened the grind for the process to P_{80} = 150 microns, with the result that the settling characteristics will be affected, and hence testing of the coarser tailings is recommended for the final design.)

7.6.2 Geochemical Characteristics

Preliminary geochemical testing was undertaken and the following significant factors determined:

- The tailings has low sulphide content (<0.01%) and thus will be non-acid generating during the operational phase.

- The supernatant and seepage is expected to be neutral to alkaline with elevated concentrations of arsenic, selenium, antimony and molybdenum.

- Post closure potential elevated concentrations of iron and manganese may generate acidity when the seepage flow is exposed to oxygen.

The design conclusions based on the preliminary data are as follows:

- Seepage control measures will be required to limit seepage outflows.

- Storm capacity on the facility will need to be sufficient to provide adequate dilution prior to release.

- A cover will need to be placed over the tailings at closure to limit water and oxygen ingress.

It is recommended that an additional phase of geochemical testing on the tailings is undertaken.

7.7 Tailings Storage Facility Design

7.7.1 Site Selection

A number of valleys within the current mine lease area were examined to assess the tailings storage potential as shown in Figure 1.1 in Appendix 7.1. This indicated that the only valley with sufficient storage potential (within the lease boundaries) was the valley to the east of the plant area.

7.7.2 General Description

The facility will be constructed in the valley to the east of the plant site as shown in Figure 1.2 in Appendix 7.1. The main embankment will be constructed at the northern end of the valley at a narrow section. The valley has three main branches and the embankment will enclose a total catchment of about 260 ha. In order to maintain the TSF as a 'water negative' facility two water dams (WD1 and WD2) will be constructed upstream of the tailings area. The water dams will divert water around the tailings area and also provide a raw water supply for the plant.

Tailings discharge will occur from the downstream (north) side of the two water dams and the eastern side of the tailings area with the tailings profile sloping down to the decant pond on the western side of the main embankment. The decant return will be pumped back to the plant for reuse in the process. It was assumed that tailings deposition commences in October 2019.

7.7.3 Embankment Construction

The main embankment will be a downstream multi zoned embankment constructed initially out of local borrow with mine waste providing the bulk of the future embankment raises.

The embankment zones will consist of an upstream erosion control layer consisting of a geotextile layer for Stage 1 replaced with rockfill for future stages when it becomes available from the pit; a low permeability (Zone A) upstream zone consisting of selected local borrow materials moisture conditioned and compacted as required to achieve a suitable low permeability and a downstream structural zone consisting of local borrow for Stage 1 and Run of Mine waste for future stages.

The embankment crest will be 10 m wide with an upstream slope of 1V:2.5H and a downstream slope of 1V:3H with nominal 5 m benches at 10 m height intervals (overall slope of 1V:3.5H). The embankment lifts will be a minimum of ~ 2 m height to ensure a downstream working platform width for fill placement of 15 m or more. Stage 1 Embankment Crest has been adjusted to ensure that even if the tailings has a flatter slope than the selected design slope (1V:120H) there is sufficient storage capacity available. The embankment staging is provided in Table 7.3.

Table 7.3 Embankment Staging

Year	Stage	Tonnage (Mt)	Months of Capacity	Crest RL (RLm)	Lift Height (m)
-1	1	1.43	12	1620.0	~25 m Max
1	2	1.70	12	1625.3	4.1
2	3	1.70	12	1630.0	4.7
3	4	1.7	12	1633.8	3.8
4	5	1.50	12	1637.1	3.2
5	6	1.50	12	1639.7	2.6
6	7	1.50	12	1642.1	2.4
7	8	1.50	12	1644.4	2.2
8	9	1.50	12	1646.3	1.9
9	10	1.36	11	1648.2	1.9
	Total	**15.4**	**Final**	**1647.1**	

The embankment levels given are the minimum height required and it is viable to raise the embankment at a faster rate to suit mine waste production schedules.

To enhance the downstream stability of the embankment, drainage will be provided at the base of the valley from the back of the Zone A to the downstream toe.

7.7.4 Seepage Control

To reduce seepage losses a number of seepage control measures will be incorporated into the TSF design as follows:

- Cut-off Trench – a cut-off trench will be constructed at the end of the Zone A to competent, low permeability foundation material (nominal 2 m depth).

- The base of the TSF area will be scarified and compacted to produce a low permeability soil liner. In areas with unsuitable material or exposed rock suitable material from elsewhere in the basin will be imported to form the low permeability soil liner.

- Underdrainage System – an underdrainage system will be constructed in the area in front of the embankment to drain the base of the tailings adjacent to the embankment and reduce water driving pressures into the underlying layers. This system will only commence operation when the area is covered by tailings.

- Underdrainage Collection Sump – an underdrainage collection sump will be installed to collect the water from the underdrainage system.

- Decant System – the decant system will be designed and operated to minimise the decant pond as much as practicable.

- Downstream Monitoring Bores – the monitoring bores downstream of the embankment will be constructed so that they can be converted to pump out bores if required.

7.7.5 Decant System

The TSF decant system will be developed in two phases:

- Phase 1 – will operate in Stage 1 when the rate of rise is high and will consist of a floating barge in the decant pond pumping return water back to the plant.

- Phase 2 – will operate from Stage 2 and will consist of a decant tower on the west abutment adjacent to the main embankment. As the supernatant pond increases in elevation, additional towers will be constructed higher up the slope. Each tower will consist of a concrete base and 1.8 m diameter slotted precast concrete pipes. The towers will be surrounded by free draining rockfill. The collected supernatant will be pumped back to the plant. If required a pump booster station could be constructed on the access causeway to the decant tower.

7.7.6 Emergency Spillway

The TSF will be designed to hold the 1 in 100 wet year rainfall runoff and/or a 1 in 100 year 72 hour storm volume. Under nominal operating conditions with the TSF managed in accordance with standard operating procedures the available stormwater storage capacity will be in excess of the design storm volume and no discharge from the TSF is expected.

In the event of an extreme event greater than the design storm any rainfall and supernatant that cannot be stored on the facility will be discharged in a controlled manner via an emergency spillway. The operational spillway will be constructed around the east side of the TSF and will be designed for the PMF event.

A closure spillway will be constructed at the lowest point in the facility through the west abutment ensuring no ponding of rainfall occurs on the facility surface post closure.

7.7.7 Tailings Deposition

The tailings delivery pipeline will be installed across WD1 and WD2 and then around the eastern side of the facility. A total of about 6 to 8 discharge points will be installed. A discharge pipeline will be extended down the valley to the top of the active tailings area. As the tailings extend up the valley the discharge pipeline will be shortened appropriately. This deposition approach will produce a sloping beach profile extending down towards the main embankment. Given the low seismicity of the site (0.02 to 0.05 g) it is not anticipated that any tailings liquefaction or slumping will occur.

7.7.8 Stability

The stability analysis has not been redone for the current design. The following points should be noted:

- In the previous DFS with a part downstream / part upstream embankment, the stability analysis using site material parameters and a downstream slope of 1V:3H indicated the embankment was stable. The current design is a fully downstream embankment with a flatter overall downstream slope of 1V:3.5H.

- In the previous DFS it was recommended that a drainage system was constructed in the downstream embankment zone to enhance stability. The current design has a downstream drainage system.

- The embankment has been relocated into the narrowest section of the valley. At its current location the 3D effects of the abutments will provide increased stability.

Based on these factors it is considered that the embankment should be inherently stable. A detailed stability analysis will be undertaken as part of the final design.

7.7.9 Dam Break

A dam break analysis is required for the TSF. The local river is about 9 km downstream of the TSF.

The overall slope from the TSF to the river is about 1V:70H. The gradient along the river is about 1V:400 to 450H. Thus it is anticipated that the tailings will flow down to the river as a slurry flow and then deposit along the river in both directions as per Figure 1.3 in Appendix 7.1. Typically along the flow path directly downstream of the TSF houses are placed on top of the ridges and hills up to 30 to 50 m above the drainage path. Thus many of the dwellings may not be impacted by a dam break flow.

Based on this preliminary assessment about 1 to 10 people may be at risk in a dam break event.

7.7.10 Closure and Rehabilitation

The closure concepts for the facility will depend on the long term geochemical stability of the tailings and the post closure land use.

The tailings surface slopes down to the proposed closure spillway and thus minimal reshaping of the surface is required.

The cover will incorporate a compacted low permeability layer to reduce infiltration and oxygen ingress into the tailings post closure.

The top section of the cover will be designed to meet the post closure land use. For example if the area is to be returned to cropping the cover materials will need to be thick enough to prevent the roots of the crops from reaching the tailings surface. If other potential land uses are proposed, the cover will need to be modified appropriately.

7.8 Water Management

7.8.1 General

The water management around the TSF consists of two components:

- The management of water on the tailings facility; in particular developing a facility water management design that is water negative.
- Supply of raw water for use in the plant.

The overall approach was based on determining the minimum catchment size that would allow the TSF to remain water negative for different tailings areas and diverting the remaining water flows in such a way that the water is available for use in the plant.

7.9 TSF Water Balance

7.9.1 Catchment Diversion

The first step in the water balance work was to determine the sensitivity of the TSF water balance to catchment area. A simple annual water balance using typical parameters was developed and the results are summarised in Table 7.4.

Table 7.4 Maximum Catchment for Water Negative Water Balance

Catchment Area	Tailings Area (ha) at Which WB Goes Water Positive
Full (Catch = 260.2 ha)	48
With WD1 (Catch = 210.5 ha)	56
With WD2 (Catch = 188.7 ha)	59
With WD1 and WD2 (Catch – 139.0 ha)	66.5

The TSF footprint based on the modelling reaches a maximum of about 58 - 60 ha. So utilising both WD1 and WD2 should be sufficient to maintain a negative water balance.

7.9.2 Water Balance – Average Conditions

A monthly water balance was developed incorporating both the TSF and the diversion systems. Under average climatic conditions the pond reaches the minimum pond size in each dry season. The maximum pond size increases each year as the area of tailings expands. See Figure 1.4 in Appendix 7.1.

The peak volume occurs in the last wet season of the operation where the pond reaches a maximum value of 537,900 m^3.

7.9.3 Water Balance – 1 in 100 Wet Year

A 1 in 100 wet year was inserted (independently) into the model in each year as shown on Figure 1.4 in Appendix 7.1. The modelling indicates that the pond increases significantly in the wet year but in the subsequent years returns back to the average pond configuration in approximately two years of average rainfall. After Year 7 it takes about three years to return to the average pond configuration. The peak volume occurs from a wet sequence over the last wet season of the operation where the pond reaches a maximum value of 1,410,800 m^3. The embankment levels as listed in Table 1.3 are primarily controlled by the 1 in 100 wet year pond volume as shown on Figure 1.5 in Appendix 7.1.

7.10 Water Storage and Diversion

7.10.1 Water Diversion

As shown on Figure 1.2 in Appendix 7.1 the area upstream of the TSF catchment area will be diverted. This will be achieved by constructing two water dams in the two valleys to the east of the plant site. Water Dam 1 (WD1) is in the valley directly below the plant site area. This storage will provide water back to the plant. Water Dam 2 (WD2) is in the next valley to the east.

Associated with the two water dams are three diversion channels:

- Diversion Channel 1 (DC1) from WD1 northwards along the ridgeline from the water management area.
- Diversion Channel 2 (DC2) from WD2 to WD1 – overflow water from WD2 will flow along the channel to WD1.
- Diversion Channel 3 (DC3) east of WD2 directing runoff from the upper east catchment into WD2.

Operationally, water will be pumped from WD1 to the plant to provide the raw water supply. Water will be pumped from WD2 to WD1 each dry season (nominally up to 50,000 m^3/month) to provide water in WD1 to supply the plant water demand. It is necessary to build the water dams and diversion system in advance of commissioning in order to accumulate sufficient water for start-up. In order to prevent a shortfall under both average and dry conditions in Year 1 the two water dams needs to be constructed early enough to capture two wet seasons prior to commissioning. Based on a plant commissioning date of October 2019 the water dams would need to be operational in March 2018.

In order to prevent a shortfall under dry rainfall conditions the two dams will need to be constructed early enough to capture two wet seasons prior to commissioning. This risk item has been considered and included in the Implementation schedule in Section 13.0. For the purposes of the schedule an assumption has been made that the construction of the dams will occur outside of the wet season. Attempts to construct the dam during the wet season may have an adverse impact on the provision of water for start-up.

7.10.2 Water Dams

The water dams will both be downstream multi zoned embankments with a 10 m wide crest and upstream and downstream slopes of 1V:3H. The embankment zones will consist of an upstream erosion control layer which will be durable waste rock of a suitable size; an upstream low permeability zone (Zone A) to reduce seepage through to the TSF area and a downstream structural zone (Zone C). The material for constructing the two water dams will be won from local borrow. If suitable durable waste rock is not available economically, HDPE could be used as an upstream face erosion control system. Table 7.5 provides design data for the two water dams.

Table 7.5 Water Dams

Dam	WD1	WD2
Catchment (ha)	49.7	105.1*
Height (m)	27	20
Storage Capacity (Mm^3)	0.58	0.332
Nominal Embankment Fill (m^3)	130,000	85,000
* Includes area from Diversion Channel 3		

It is recommended that the downstream faces of the water dams are vegetated to reduce erosion and sediment loss.

7.10.3 Diversion Channels

The diversion channels are designed based on diverting the bulk of the rainfall runoff from the upstream catchment and transferring water from water dam to water dam. The channels will have a base width of 2 m and be a minimum of 0.8 m deep giving a maximum flow rate of 4 m^3/s or up to 300,000 m^3/day.

For storm events that result in flows larger than the design, the diversion channels will overflow into the TSF area. Similarly both water dams will have emergency spillways to discharge into the TSF to prevent overtopping of the water dam embankment.

7.10.4 Water Supply

The two water dams are insufficient to supply the full plant water demand under both average and 1 in 100 dry year climatic conditions. The model was run with an external bore input based on the bore running for six months during the dry season (December to May) each year. Table 7.6 summarises the bore input requirements.

Table 7.6 Bore Input Flows

Climatic Conditions	Bore Supply Rate (L/s)	Shortfall Years
Average	**8.50**	**2 to 5**
1 in 100 Dry Year		2 to 5
Year -2	9.63	2 to 5
Year -1	12.54	2 to 5
Year 1	15.47	2 to 5
Year 2	17.31	2 to 5
Year 3	15.13	2 to 5
Year 4	11.98	2 to 5
Year 5	9.58	2 to 6
Year 6	8.50	2 to 7

A minimum bore inflow rate (assumed to be pumped into WD1) of 8.5 L/s will be required to prevent shortfalls under average climatic conditions increasing to a supply rate of 17.3 L/s for 1 in 100 dry year climatic conditions.

7.11 Sediment Control

The design of the TSF and water management system provide a high level of sediment control in the existing structures as follows:

- The water dams will act as sediment traps for the upstream catchments.
- The TSF will act as a sediment trap for flows off the water dam embankments and areas to the south of the water dams.

A sediment control pond will be constructed downstream of the TSF embankment to capture sediment generated by runoff from the embankment. In later stages the downstream section of the embankment will be constructed of waste rock and the sediment control requirements will be reduced.

7.12 External Water Sources

The construction of the water dams in advance of commissioning will result in sufficient water availability for the plant raw water needs for Year 1. Water demands for dust control or pit operations will need to be supplied from other sources.

7.13 Design

Refer to Appendix 7.2 for further design drawings of the TSF and Water Dams.

8.0 OFFSITE INFRASTRUCTURE

8.1 Introduction

Onsite Infrastructure remains unchanged except for the relocation of TSF and WD embankments and relocation of the Mining and Administration facilities and buildings to an area adjacent to the plant to reduce bulk earthwork costs. The relocation of Mining and Administration facilities was possible due to optimised plant layout.

A full description of the on-site facilities is given in the 2015 DFS and the new locations are shown in the updated general layout drawing included in Appendix 6.5.

It is envisaged that a 32 month construction period will be required between project start (Financing and Implementation of Resettlement Action Plan) and first gold pour in order to construct all the necessary project supporting infrastructure and mining and processing facilities.

The location of existing and proposed Offsite infrastructure which will be required for the development of the project is given in Figure 8.1.

The selected Tulu Kapi site is an undeveloped mining site with limited existing infrastructure consisting of the existing exploration camp. New infrastructure will be required to support the mining, processing and construction operations. The main infrastructure required for the development of the project can be broken down into two main areas, Offsite Infrastructure (outside the mining lease) and Onsite Infrastructure (within mining lease boundaries). Facilities and Infrastructure within these areas are as follows:

Onsite Infrastructure

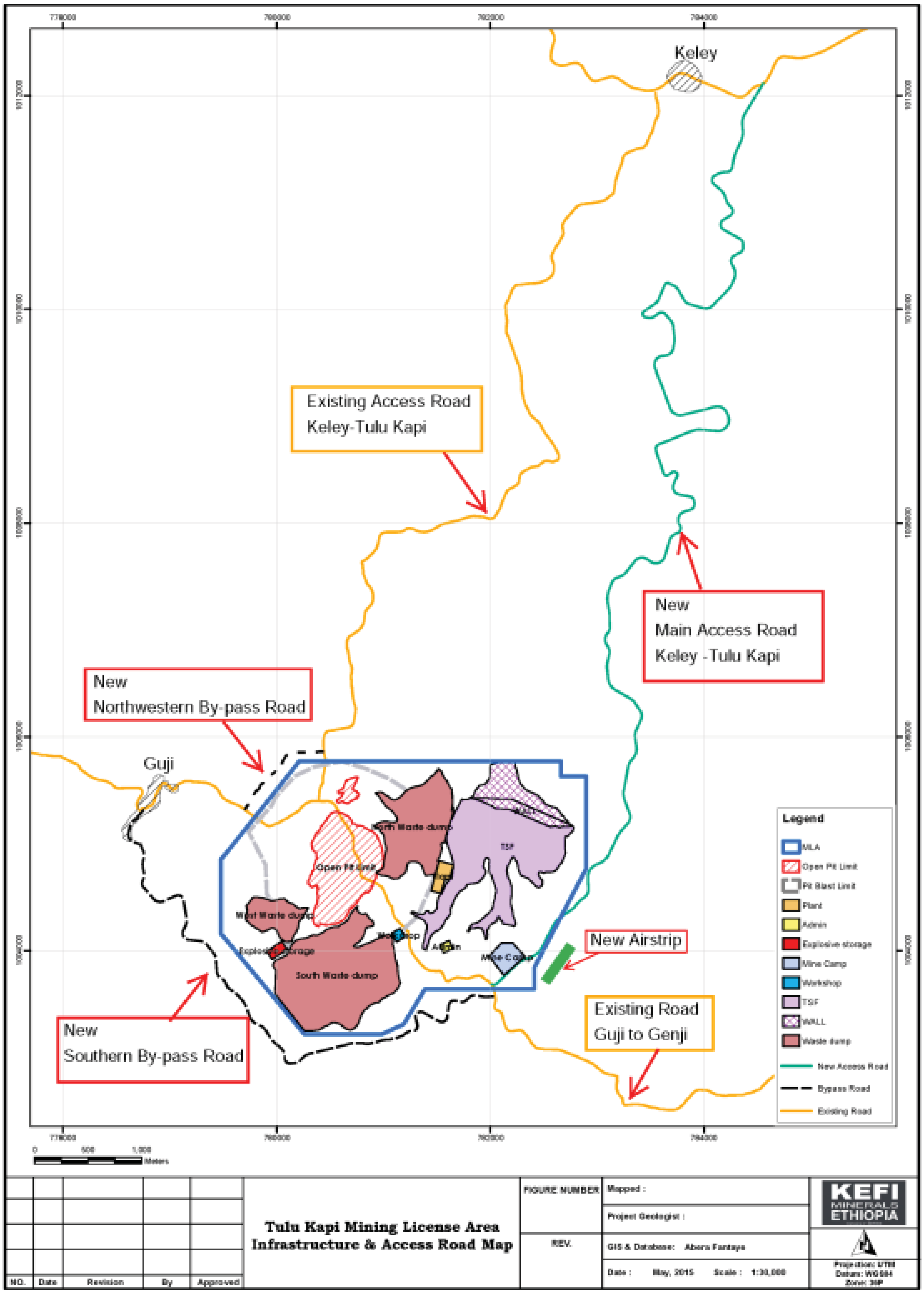
- Mining haul roads.
- Mining and maintenance workshops.
- Fuel and lubricant storage.
- Explosives magazine.
- Warehouses and lay down yards.
- Power distribution.
- Emergency power plant.
- Administration buildings and first aid clinic.
- Assay laboratory.
- Water supply system.
- Mine accommodation camp.

- Raw water supply dams.
- Plant Tailings Storage Facilities (TSF).
- Sewage treatment and disposal site.

Offsite Infrastructure

- Main access road.
- Community bypass roads.
- Grid power supply.
- Air strip.

Figure 8.1 Mine Licence Area and Offsite Infrastructure



8.2 Offsite Roads

Although there are existing roads in the project area, to minimise impact on the local community the Tulu Kapi Gold Project will require, during the project implementation period, the construction of two major roads that lie outside the mine licence area, specifically:

- The Keley to Tulu Kapi Main access road which has a total length of approximately 14.2 km.
- The Southern bypass road which has a total length of approximately 4.0 km.
- The Northwest bypass road which has a total length of approximately 1.0 km.

Since the 2015 DFS the Government has upgraded the main highway to Gulliso and other secondary roads in the vicinity of the project. Based on these upgrades, access and bypass road routes were re-evaluated in order to assess the possibility of reducing project capital costs and further minimising impact on local communities.

The alternative routes which were evaluated and Access Route options report is given in Appendix 7.2.

8.2.1 Main Access Road Optimised Design

The Access Route options study has shown that the Main Access Road as based on the 2015 DFS is still the most viable option to minimise impact on the local community and has the lowest cost option.

The Keley to Tulu Kapi access road was originally designed for the 2015 DFS as an unpaved Design Class DS5 road for mountainous terrain in accordance with the Ethiopian Roads Authority's Design Manual for Low Volume Roads. The road was designed to be 7 m wide and with a maximum road grade of 9%.

In order to reduce cost the road was re-aligned in certain areas and the classification to which it should be built was revised from a DS5 (as per DFS) to a DS6 access road.

The DS6 classification specifications are six meters wide and with a maximum road grade of 12%. The 12% grade is not suitable for the fuel trucks if the length of this grade is longer than 400 m. This has been incorporated into the design.

Where the road crosses the Birbir River the bridge will be designed and constructed to DS5 classification; this will allow KEFI to upgrade the road to a DS5 classification if required at a later date.

The Main Access Road is designed to ensure heavy vehicle access to the project site during the production period is diverted away from the current Keley and Genji road. This will allow the public to travel safely along the existing road. The new road will be designed and constructed to meet the Ethiopian road standards.

The new Kely to Tulu Kapi main access road ties into the mine access road which is inside the mine licence area. Traffic on the main access route to the Tulu Kapi access road will be able to drive to the Mine Accommodation Camp, Mine Maintenance facility, Administration Building, and Process Plant.

In July 2016 it was noticed that the Zone Administrator had started upgrading the 'New' Keley – Tulu Kapi access route. Additional cost savings are expected during the permitting and construction period once a final detailed design is carried out by optimising the final route to take into account the upgrade which has been initiated by the Zone Administrator and evaluating closely construction options for the bridge crossing the Birbir River.

The design drawings, estimated bill of quantities and estimated pricing for the Main Access Road are included in Appendix 7.2.

8.2.2 Southern Bypass Road Optimised Design

The Southern Bypass road to be constructed as per the 2015 DFS will require only minor re-alignment.

The Southern Bypass will be constructed to provide connectivity to the existing rural roads making best use of the topography to provide acceptable gradients and minimise disruption to the local community. The bypass roads will maintain existing traffic patterns and will be constructed as an unpaved, 3 m wide, Design Class DS9 road for Mountainous Terrain in accordance with the Ethiopian Roads Authority's Design Manual for Low Volume Roads. When completed, the road will be surfaced with a 150 mm thick crushed rock wearing surface.

The design drawings, estimated bill of quantities and estimated pricing for the Main Access Road are included in Appendix 7.2

8.2.3 Northern Bypass Road Optimised Design

The Northern Bypass road will be constructed as per the 2015 DFS but will following an alternative existing track to that used in the 2015 DFS. This will reduce the length from approximately 2.3 km to 1.0 km.

The Northern Bypass connects the existing north-south access road with the existing east-west Guji / Genji public road near the village of Guji and will follow existing tracks. Northern bypass is designed to divert local traffic away from the mining licence area and more specifically from the 500 m blast perimeter. The road will not be required during the initial project implementation phase and construction may be delayed until after operations commence.

The design drawings, estimated bill of quantities and estimated pricing for the Main Access Road are included in Appendix 7.2.

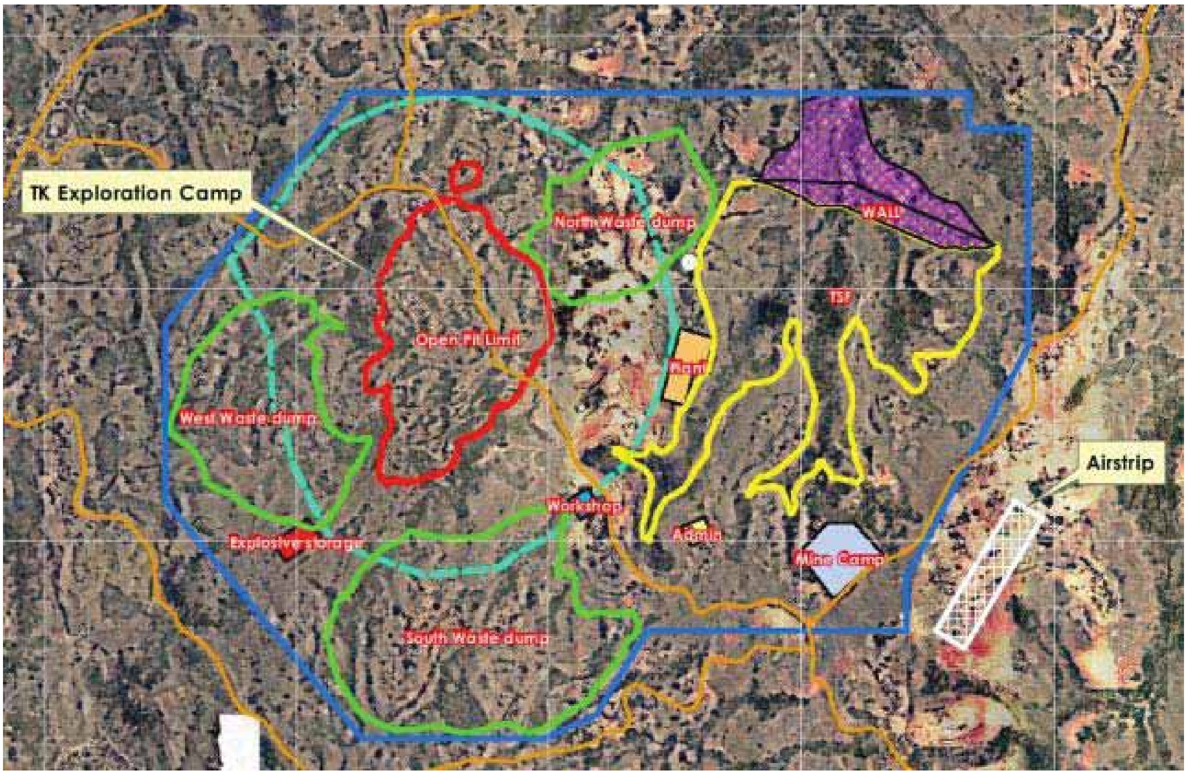
8.3 Airstrip

For the 2015 DFS a 35 m diameter helipad (helicopter landing zone) was included in the design and capital cost. The helipad was located immediately north of the gold room within the process plant area. The helipad was provided to support helicopter transport of gold bullion from the plant directly to Addis Ababa and cater for emergency events.

This has now been replaced with an airstrip.

A suitable location for the construction of an airstrip has been identified as shown below in Figure 8.2.

Figure 8.2 Tulu Kapi Gold Project Airstrip Location



The 1.2 km airstrip for daylight use only is located adjacent to the mine accommodation camp. A service will be negotiated and implemented using a local Ethiopian aviation contractor to run regular services as required between site and Addis Ababa using 'Cessna C208B Grand Caravan' type aircraft. The C208B Grand Caravan is a single-engine turbine STOL capable aircraft capable of carrying up 12 passengers or up to 1.5 t of cargo. It has a large rear side cargo door and has a range of over 850 nautical miles and it is able to land on short, unprepared airstrips.

Local engineering company, CCC Engineering (Addis Ababa, Ethiopia), has carried out a study for the design and cost of the airstrip. The estimated bill of quantities and pricing for the airstrip are included in Appendix 7.2.

8.4 Grid Power Supply

Grid Power design remains unchanged from the 2015 DFS. The EPC cost in the capital cost estimate has assumed power will be made available by KEFI.

9.0 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Environmental and Social Impact Assessment remains unchanged from the 2015 DFS.

9.1 Introduction

An Environmental and Social Impact Assessment (ESIA) was undertaken and submitted to the Federal Ministry of Mines (MoM) in October 2014 for approval together with the mining license application. This submission was accompanied by a Resettlement Action Plan (RAP) for the families to be resettled that are located within the mining license area.

The ESIA was undertaken for the proposed development based on the 2015 DFS pit design and mining schedule which was based on a 10 year mine life with low grade stockpile treatment from Years 11 to 13 and a processing rate of 1.2 Mtpa.

The Project impacts and associated mitigation measures, based on the aforementioned pit design, as presented in the ESIA were assessed by the ministerial committee and the ESIA for the Tulu Kapi Project and an approval letter was issued on 9 April 2015 by the Federal Ministry of Mines (MoM).

The current pit design and associated Project description does not differ appreciably from that considered in the ESIA. The only key differences are:

- Relocation of the TSF starter embankment approximately 100 m to the north-east to reduce initial capital costs (footprint remains the same).
- Increased processing rate which reduces current project LOM from 13 years to 10 years.
- Re-alignment of processing plant to decrease site infrastructure footprint.

Engineering considerations associated with the TSF starter embankment and storm water channel realignments are included in this Study design. Final construction designs will be submitted to the relevant authorities as stipulated in the Mining License; however, as indicated in the ESIA approval letter, the environmental and social impacts associated with these developments do not need to be addressed in an ESIA amendment as they do not constitute significant changes to the project design that result in changes to the predicted environmental, socio-economic and health impacts.

9.2 Resettlement Action Plan (RAP)

The terms of the RAP are based on the provisions in the Mining Agreement and remain unchanged.

An initial Resettlement Action Plan (RAP) has been developed in consultation with the community to address the resettlement of these people. The RAP describes the policies, procedures, compensation rates, mitigation measures and schedule for resettlement.

The approach to involuntary resettlement is consistent with the IFC’s performance standards on Environmental and Social Sustainability and will adopt a collaborative approach involving the Government of Ethiopia and the affected communities.

Compensation policies and procedures were established in an open and transparent manner with the intention of restoring and improving the livelihoods of the affected people with reward for self-reliance and self-help. Only those who have been identified as having a legitimate interest in respect of immovable assets such as structures, crops and land use will be eligible for compensation.

Households identified for resettlement will be primarily responsible for the design and construction of their own residential houses on the selected sites. Even though resettlers will be fully compensated for the value of their existing property, KEFI will consider potentially providing starter houses for eligible resettlers. The purpose of the starter houses would be to offer shelter at the resettlement from Day 1 of the relocation and the design is intended to facilitate building of extensions to the starter house by the resettlers.

Studies have identified, recorded and valued all assets eligible for replacement or compensation. If a person is eligible for resettlement or relocation compensation there will be a sign off procedure that will be followed. This procedure will ensure that the person meets the requirements and understands the level of compensation that will be offered.

The Relocation Action Plan (RAP) will be implemented by a team of professionals comprising senior members from KME and Government Ministries. The RAP provides for the monitoring of the resettlement program to assist and improve the living conditions of the affected people. This will verify that all commitments within the RAP are met.

KEFI and Government of Ethiopia are particularly focussed on livelihood restoration support and improvement for households affected by resettlement. All project decisions will be considered in the context of a mainstreaming of livelihood considerations. In this sense, all aspects of the land access, resettlement and mine development are considered in terms of livelihood implications, to ensure all key project decisions promote livelihood restoration and development. An example of this is the detailed analysis which is being undertaken on potential resettlement host lands in terms of livelihood factors, and this will influence and inform the site selection decision-making process.

9.3 Environmental Management Plan

The terms of the Environmental and Social Management Plan (ESMP) are based on the provisions in the Mining Agreement and remain unchanged.

The primary aim of the ESMP is to mitigate negative impacts and enhance positive benefits of the Project. The ESMP comprises a series of individual plans that outline the scope of environmental, social and health management pertaining to compliance with applicable regulatory requirements. It translates the findings and recommendations of the ESIA into clear measures for the management and monitoring of impacts during the three project phases. KEFI will implement, maintain and update the following plans in accordance with the provisions of the ESMP for both construction and operations.

- Air Quality Management Plan.
- Noise and Vibration Management Plan.
- Water Management Plan.
- Waste Management Plan.

- Flora and Fauna Management.
- Social Management Plan.
- Cultural and Heritage Resources.
- Emergency Response Plan.

KEFI will develop and implement an Environmental Management System (EMS) to a recognised standard in accordance with their environmental policies to ensure the management of environmental impacts caused by the Tulu Kapi mine and operations are continually monitored and improved.

KEFI will ensure the availability of the human and financial resources needed to conduct all environmental management, mitigation and monitoring activities at the Tulu Kapi mine throughout the construction, operation and closure phases.

10.0 PERMITTING

Permitting remains unchanged from the 2015 DFS.

10.1 Introduction

When the Mining Licence was issued, a Mining Agreement with the Government of Ethiopia, which sets the fiscal regime, taxation and royalties as they affect the operation of the mine, was also signed. The Licence and Mineral Agreement (MA) were signed by KEFI and the Company's wholly owned subsidiary (KME) on 13 April 2015.

Under the MA, KME was granted a Mining Licence valid for 20 years (renewable) which fully permits the development and operation of the Tulu Kapi Gold Project. The Mining Licence can be renewed, with each renewal subject to a maximum period of 10 years.

The issuance of the Mining Licence also marks the Government's approval of the Environmental and Social Impact Assessment, including the Community Resettlement Action Plan which was prepared by Golders.

Under the MA, the Government of Ethiopia is entitled to a 5% free carried interest in KME. In addition, the Government of Ethiopia receives a 7% royalty on the revenues from mineral production.

The Government has also re-confirmed its intention to make an equity investment at project level of circa US$20 million to fund the power line, offsite infrastructure and a portion of the resettlement costs. This investment will result in the Government stake increasing to circa 25% (including the pre-existing 5% free carried interest).

10.1.1 Ancillary Licences and Authorisations

The Company has scheduled the applications for ancillary licences and authorisations, including transport, construction and power, as and when required from provincial authorities (these are of a more routine and procedural nature). The triggering of the resettlement program is scheduled to commence to coincide with project finance approvals.

A summary of the key permits required under the Ethiopian Modern Mining Act is set out below.

Table 10.1 Permitting Requirements

Requirement	Type of Work	Regulation/Permit	Government Authority	Required by	Comments
ESIA Compliance Letter	Environmental and social impact assessment	Proclamation 299/2002	Ministry of Mines	13/04/2015	Issued on 09/04/2015
Cultural Heritage Study	Exploration /study	Proclamation 209/2000	Cultural Heritage	2nd qtr 2017	Covered as part of ESIA, but will be Updated
Waste Disposal	Generate, store, transport, treat, or dispose of hazardous waste	Proclamation 300/2002	Environmental Pollution Control	3rd qtr 2017	Required in order to commence construction
Chemical Use	Importation, preparation, storage, distribution, transport or use of chemicals categorized as hazardous or restricted use	Proclamation 300/2002	Environmental Pollution Control	1st qtr 2018	Required in order to commission the processing plant
Water Use Permit	Use of water resources, discharge of waste, construction of waterworks	Proclamation 197/2000	Water Resources Management	N/A	As designed, the mine will not require this permit to operate
Water Use Permit	Use of project water in line with water resources management	Proclamation 534/2007	River Basin Councils and Authorities	1st qtr 2018	Required for release of water to baseline conditions to local waterways
Nuclear Permit	Importation or transportation or use of radioactive substances	Proclamation 300/2002	Environmental Pollution Control	1st qtr 2018	Required in order to import process plant components
Communication Licences	VSAT, radios	-	-	Ongoing	KEFI already has VSAT and radio licences
Electrical	For 15 MW supply of power	Regulation 170/2009	Ethiopian Electric Power Corporation	N/A	Ethiopian Government is going to Construct for equity in the project.
Explosives Use Permit	For blasting	-	Ethiopian Security Agency	4th qtr 2018	Not expected for initial mining
Trading Licence	For importation of goods		Ministry of Trade	N/A	Registration required – but Mining Licence is equivalent
Health Permit	Constructing buildings for public services	Proclamation 200/2000	Ministry of Public Health	3rd qtr 2017	In addition to local health authority; may be required for resettled peoples and camp health post

Requirement	Type of Work	Regulation/Permit	Government Authority	Required by	Comments
Timber Removal	For removal of timber to local markets	Proclamation 542/2007	Forest Development, Conservation and Utilisation	N/A	Only in the event that trees are cut and moved to market
Tree Removal Permit	For removal of trees during project construction		Oromia Forestry and Wildlife Directorate	3rd qtr 2017	Will be required to commence construction works
Road Construction Permit	Construction of gravel road to rural standards		Oromia Regional Roads Authority	N/A	Ethiopian Government is going to Construct for equity in the project.
Construction Permit	Construction of buildings for camp	Proclamation 624/2009	Ethiopian Building designated organisation	3rd qtr 2017	Planning consent required in order to obtain a permit.

11.0 CAPITAL COST ESTIMATE

11.1 Capital Cost Introduction

This section has been prepared to provide an understanding on how the project Capital Cost Estimate (CCE) has been developed and to provide information on what is and is not included in the scope of the CCE for the purpose of this report.

The capital cost estimate prepared assumes a greenfield gold project capable of processing a nominal 1.5 Mtpa as a contractor-operated open pit mine, with a conventional grinding, CIL plant design. In order to carry out the necessary analysis, sufficient design, scheduling and equipment costing has been carried out post 2015 DFS by way of the Lycopodium FEED to update the capital cost estimates to an accuracy of +15% to -15%. In addition Lycopodium together with Knight Piésold has carried out an assessment of the TSF and Water Dams options. A suitable option was selected, reviewed in collaboration with KEFI and Increva, quantified and estimated for inclusion of this CCE update.

11.2 General Estimating Methodology

The CCE was prepared in accordance with Lycopodium standard estimating procedure and has been compiled using a first principles estimating philosophy.

This estimate is based on an implementation strategy using a combination of Principal, 'self perform' portions of scope and engineering, procurement and construction management (EPCM) for the balance, in line with the implementation strategy and schedule as described in Section 13.0 of this report.

Preliminary engineering drawings have been produced with sufficient detail to permit the assessment of the engineering quantities for earthworks, concrete, steelwork, mechanical and electrical for the crushing plant, processing plant, conveying systems and infrastructure.

The updated capital costs for processing plant and infrastructure have been grouped by initial capital and sustaining capital for the purposes of the financial analysis.

A summary of the initial and sustaining capital cost for the Tulu Kapi Project is provided in Table 11.2. The cost includes the construction, pre-development and commissioning period. The estimates include direct costs, indirect costs and contingency.

11.2.1 Summary

The overall project CCE was compiled by Lycopodium from inputs developed by Lycopodium, Knight Piésold and KEFI. The CCE reflects the Project scope as described in this study report. The primary contributors listed in Table 11.1 were responsible for the preparation of area capital costs.

Table 11.1 Capital Cost Contributors

Area	Contributors Name
EPC Total Price	Lycopodium Pty Ltd – based on Front-End Engineering and Design (FEED)
EPCM Scope of Works (Bulk Earthworks)	Lycopodium Pty Ltd / Knight Piésold Pty Ltd
First Fill and Spares	Lycopodium Pty Ltd – based on Front-End Engineering and Design (FEED)
Mining Cost	Mining and Cost Engineering Pty Ltd (MACE) –based on contract mining proposal
Offsite Infrastructure Cost	KEFI
Owners Cost	KEFI
Other Cost	KEFI
Taxes	Lycopodium Pty Ltd calculation

Table 11.2 Capital Cost Estimate Summary - April 2017

Description	Initial Capital US$	Sustaining Capital US$	Total Capital US$
EPC Total Price	69,424,841		69,424,841
EPC Adjustment resulting from scope change	1,472,515		1,472,515
Revised EPC Value	70,897,356		70,897,356
EPCM Scope of Works			0
Bulk Earthworks	14,582,574	10,506,045	25,088,619
Other Allowances	970,000		970,000
Contingency	3,110,515	2,101,209	5,211,724
First Fill and Spares	4,337,446		4,337,446
Mining Cost	15,823,000	1,097,000	16,920,000
Offsite Infrastructure Cost	15,671,000	473,000	16,144,000
Owners Cost	18,111,986		18,111,986
Other Cost	17,739,555	830,000	18,569,555
Closure Provision		9,483,393	9,483,393
Total	**161,243,432**	**24,490,647**	**185,734,079**

11.2.2 Potential Capital Cost Tax Implications

In the preparation of the CCE the final tax implications for the project remained uncertain despite some broad undertakings in the Mining License that exceptions may be provided. For the purpose of clarity and identification of this risk element, below is an outline of potential tax that, from a conservative view point, may be applicable. Ongoing direction and advice will be required from authorised tax professionals as the project progresses.

Table 11.3 Potential Capital Cost Tax Implications

Description	Initial Capital (US$ '000)
EPC	
Offshore Services – No WHT claimable: 15% / (1 - 28% - 15%) = 26.3%	1,653
Offshore Supply - 3% WHT (Goods imported by KEFI will attract a 3% WHT however KEFI should qualify for an exemption)	1,386
Onshore Services 15% VAT and 2% WHT	3,616
Onshore Supply (assumed all offshore) 15% VAT	0
Onshore Supply - Bulk Earthwork contractor taxes. 15% VAT	1,900
Onshore Services - Bulk Earthwork contractor taxes. 15% VAT and 2% WHT	326
Mining Costs	2,373
Offsite Infrastructure Costs	2,351
Owners Costs	2,717
Other Costs	2,661
Total	**19,370**

11.3 Capital Costs Exclusions

The estimate is expressed in United States dollars and the following items are not included in the capital estimate:

- Sunk costs that are expected to be incurred prior to project implementation.
- Interest and financing costs.
- Escalation beyond first quarter 2017 for the updated Capital costs.
- Escalation beyond first quarter 2015 for the Capital costs which have not been updated (i.e. Grid Power line, closure costs).
- Force majeure occurrences.

Scheduled delays such as those caused by the following:

- Scope changes.
- Unidentified ground conditions.
- Labour disputes.

- Environmental permitting activities.
- Currency fluctuations.
- Import duties.
- Permits.

11.4 Capital Cost Accuracy

The capital cost estimate included in this Study has been developed to a level sufficient to evaluate the project, various development options, and the potential overall project viability.

The accuracy range of the capital cost is considered to be plus or minus 15%. The accuracy prediction for the Tulu Kapi Project takes into account the current state of engineering and procurement. 100% of FEED has been completed. For the FEED study, budgetary quotations were obtained for commodities and labour, and process equipment.

11.5 Process Plant Capital Cost Estimate

11.5.1 Process Plant Capital Cost Summary

Table 11.4 Process Plant Initial Capital Cost Summary

Offshore Supply Contract			
Item	**Description**	**Compensation Model**	**Total (US$ '000)**
SP1	Offshore Technical Services	Fixed Price	6,285
SP2	Offshore Equipment Supply	Fixed Price	41,870
CP1	**Offshore Contract Price**		**48,155**
SP3	Transport & Logistics Services	Provisional Sum	5,262
SP4	Take Out Liner Handler		1,300
SP5	Take Out Potable Water Treatment		343
Onshore Construction Contract			
Item	**Description**	**Compensation Model**	**Total (US$ '000)**
SP6	Onshore Construction	Fixed Price	21,270
CP2	**Onshore Contract Price**		**21,270**
SP7	Onshore Provision of Sand for Concrete	Provisional Sum	220
CP1+CP2	**Total Price**		**69,425**
SP8	Coordination Agreement Clarifications	Fixed Price	375
SP9	Escalation (from Original submission to Current only)	Fixed Price	1,098
CP3	**EPC Adjustment resulting from scope change**		**1,473**
CP1+CP2+CP3	**Revised EPC Value**		**70,897**

The Contract Price CP2 includes line item SP7 as a Provisional Sum.

The Contract Price CP1 includes line item SP3 as a Provisional Sum.

The Contract Price CP1 includes line items SP4 and SP5.

11.5.2 Basis of Estimate and Assumptions for Processing Plant Capital Cost

The following technical documents developed during FEED form the basis of the capital cost estimate:

- Process plant design criteria.
- General layouts of the process plant.
- Process flow diagrams.
- Process plant equipment list.
- Piping and instrument diagrams.
- Instrument lists.
- Various discipline material take-off documents.
- Electrical single line diagrams.
- Quotations from vendors on major mechanical and/or process equipment.
- Project Implementation Schedule.

The following assumptions have been made in the preparation of this estimate:

- Site work will be continuous and not be constrained by the owner, war, riots, terrorism or political interference.
- The construction schedule as presented in Section 13.0.
- Land within the mine licence and access road areas will be provided encumbrance free.
- The chosen site will be suitable for the foundations in accordance with the findings of the geotechnical investigation report and no specific problems will arise from excessive precipitation or groundwater, and no rock excavation will be required during excavation.
- An allowance has been made for the application of Ethiopian tax. Confirmation of the applicable tax implications will be required prior to contract award.
- The EPC Total Price is based on an insurance deductible of USD 50,000 per any one occurrence.
- The Total Price is based on the exchange rates in Table 11.5.

- KEFI at no cost to Lycopodium will provide translation of any documents from English to any other language as may be required. All documents and communications produced by Lycopodium will be in English.

- No allowance has been made for political risk insurance cover.

- It has been assumed that, borrow pits for all imported fill, including but not limited to structural fill, sand and gravel, will be within 5 km of the plant site.

- It has been assumed that spoil and wastage material arising from the bulk earthworks will be able to be deposited within 5 km of the plant site.

- It has been assumed that adequate area is available for the storage of topsoil within 500 m of each area.

- An allowance has been made for a pontoon decant arrangement in the TSF for the first year with a further allowance in the sustaining capital cost to relocate the mechanical and electrical, instrumentation and controls components to a decant tower, which has also been provided for in the estimate.

- Lighting design and subsequent estimate has been based on the requirements as per Australian Standards

- All site security during construction will be provided by KEFI Minerals. Costs for such are included in the owners cost.

- All transfers from the airport in Addis Ababa to KEFI guest house and site will be provided by KEFI Minerals. An allowance for associated costs are included in the owners cost.

- All dust suppression during construction and commissioning will be provided by KEFI Minerals. An allowance for associated costs is included in the owners cost.

- It has been assumed that construction water will be made available at no cost to Lycopodium within the plant site from the early bore development utilising the existing bores at the site. An allowance has been included in the owners cost.

- An allowance has been made for foundation improvement at the SAG Mill and CIL tank area only which has been based on the limited geotechnical data available at the time of preparation of the estimate. Confirmation of requirements will be required upon receipt of adequate geotechnical data.

- In order to meet the water requirements for start up, the construction of the Water Dam has been schedule to allow for the collection of 2 wet seasons (May to October) of rain.

- Allowances have been made for the following geotechnical tests including associated laboratory testing.

  - 6 off 30 m boreholes

  - 11 off 20 m boreholes
  - 60 off test pits.
- Allowances for management, attendance and supervision of the geotechnical investigation and bulk earthworks contract have been for an assumed 8 month combined period.
- The bulk earthworks estimate is based on the provision of quantities as outlined below:
  - Mine Camp – based on KEFI Minerals supplied quantities.
  - Plant Access Roads – based on KEFI Minerals supplied quantities.
  - Bush Stripping and Clearing – based on KEFI Minerals supplied quantities.
  - Plant, Administration, Mine Laydown – based on Lycopodium preliminary layout.
  - Internal Plant Access Roads – allowance only.
- Allowance has been made for one fulltime on site environmental officer during construction on the basis that the Lycopodium standard procedures will be sufficient to satisfy KEFI environmental requirements.
- It has been assumed that if there is a need to transfer water from Water Dam 2 to Water Dam 1, this would be undertaken by mine operations using a pit dewatering pump and hose or the like.
- It has been assumed that the TSF Stage 1 will be for the first year of operation only.
- It has been assumed that Stage 2 onward lifts of the TSF will be undertaken by the proposed mining contractor AMS and has been estimated accordingly utilising rates supplied by AMS.

11.5.3 Estimate Parameters

The basic parameters of the estimate are as follows:

- Estimate Accuracy: +/- 15%
- Estimate Currency: United States Dollars
- Estimate Date: 11 April 2017

11.5.4 Exchange Rates

The EPC cost is based on the following exchange rates as shown in Table 11.5 and the price will be subject to revision prior to Award of Contract pending final agreement of the exchange rates.

Table 11.5 Rate of Exchange Applied

Currency	Rate of Exchange (US$ bid)	Currency Breakdown (%)
United States Dollars (USD)	1.000	31.105
Australian Dollars (AUD)	1.3161	22.830
Euro (€)	0.897	29.531
South African Rands (R)	14.388	16.624
Ethiopian Birr (ETB)	22.3	0

11.5.5 Sources of Estimate Information

The CCE is based on inputs from various sources as shown in Table 11.6

Table 11.6 Source of Estimate Information

Description	Quantities	Rates	Estimate	Construction Management
EPC Value	Lycopodium			
Bulk Earthworks				
TSF				
TSF Construction Stage 1	Knight Piésold	Lycopodium		
TSF Construction Stage 2 - 10	Knight Piésold	Lycopodium		
Sediment Control	Knight Piésold	Lycopodium		
Decant System	Knight Piésold	Lycopodium		
Decant Pontoon to Tower Mechanical and Electrical Allowance	Lycopodium			
Raw Water				
Water Dams Construction	Knight Piésold	Lycopodium		
TSF and RW Dam Engineering, Testing, Supervision				
Foundation improvement - Design	Knight Piésold			
TSF and Raw Water Engineering and Design including Project Management	Knight Piésold			
Construction Material Assessment	Knight Piésold			
TSF and RW DAM Site Investigation	Knight Piésold			
General Site Investigation	Knight Piésold			
Geotech Testing Supervision	Knight Piésold			
Bore Hole Testing	Knight Piésold			
Engineering Interface and Construction Management of Bulk Earthworks	Lycopodium			

Description	Quantities	Rates	Estimate	Construction Management
Infrastructure				
Mine Camp	KEFI	Lycopodium		
Plant Site Access Road (within Mining Lease only)	KEFI	Lycopodium		
Plant, Administration And Mining Contractor Laydown Pad	Lycopodium			
Bush Stripping and Clearing for Top Soil Storage Areas	KEFI	Lycopodium		
Temporary Access Road for Tailings, Decant, RW lines	Lycopodium			
Plant Foundation Improvement				
Foundation Improvement - SAG Mill	Knight Piésold	Lycopodium		
Foundation Improvement - CIL Tank Area	Knight Piésold	Lycopodium		
Other Allowances				
Early Bore Development - Make up Water - Allowance	Lycopodium			
40 person Fly Camp for Initial Construction	Lycopodium			
Contingency				
Contingency EPCM scope	Lycopodium			
First Fill and Spares				
Commissioning Spares	Lycopodium			
Operational Spares	Lycopodium			
Insurance Spares	Lycopodium			
First Fills	Lycopodium	KEFI	Lycopodium	
Opening Stock	Lycopodium	KEFI	Lycopodium	
Mining Cost				
Owner's Mining Equipment	MACE			
Capital Development	MACE			
Pre-strip	MACE			
Owner's Mining Team	KEFI			
Offsite Infrastructure Cost	KEFI			
Overhead Power Lines	KEFI			
Mine Camp	KEFI			
Access Roads and Airstrip	KEFI			
Owners Cost	KEFI			
Other Cost	KEFI			
Losses During Ramp Up / Working Capital	KEFI			
Relocation / Resettlement	KEFI			
Environmental Management	KEFI			
Additional Contingency	KEFI			
Closure Provision				
TSF Closure	Lycopodium			KEFI
Mine Waste Dump Closure	KEFI			

Description	Quantities	Rates	Estimate	Construction Management
Site Clean Up	KEFI			
Equipment	KEFI			

11.5.6 Quantity Development

The project works have been quantified to represent the currently defined scope of work and, where necessary, to enable the application of rates to determine costs. Allowances for compaction, waste, rolling margin and the like are included in the build-up of unit costs.

Quantity information has been derived from a combination of sources and categorised to reflect the maturity of design information as follows:

- Take-off from detail design documents specific to the Project, e.g. developed drawings, equipment lists.
- Take-off from engineered conceptual designs, e.g. engineering sketches or descriptions.
- Estimated from plot plans, general arrangements or previous experience.
- Factored from historical project information based on capacity or similar metric.

11.5.7 Pricing Basis

Estimate pricing has been derived from a combination of the following sources:

- KEFI self-perform budget estimates.
- Project specific budget quotations.
- The Consultant's database.
- Estimated or built-up rates.
- Factored from similar works.

Pricing has been identified by the following cost elements, as applicable, for the development of each estimate item.

11.5.8 Supply

Plant Equipment

This component represents prefabricated, pre-assembled or off-the-shelf types of mechanical or electrical equipment items, either fixed or mobile. Pricing is inclusive of all costs necessary to purchase the goods ex-works including delivery to site (unless otherwise stated) as well as any required vendor representation, operating and maintenance manuals and commissioning spares.

Bulk Materials

This component covers all other materials, normally purchased in bulk form, for installation on the project. Costs include the purchase price ex-works, any off-site fabrication, transport to site, unless otherwise stated, and over-supply for anticipated wastage.

Installation

This component represents the cost to install the plant equipment and bulk materials on site or to perform site activities. Installation costs are further divided between direct labour, equipment and contractors' indirects.

The labour component reflects the cost of the direct workforce required to construct the project scope. The labour cost is the product of the estimated work hours spent on site multiplied by the cost of labour to the contractor inclusive of overtime premiums, statutory overheads, payroll burden, and contractor margin. The labour and cost component for earthwork, concrete, structural steel, platework and piping was pre-approved by both parties.

Direct hours, by the construction workforce, for all disciplines, for installation are based on Australian norms.

The equipment component reflects the cost of the construction equipment and running costs required to construct the Project. The equipment cost also includes cranes, vehicles, small tools, consumables, PPE and the applicable contractor's margin.

Contractors' indirect costs encompass the remaining cost of installation and include items such as offsite management, onsite staff, supervision above trades level, crane drivers, mobilisation, demobilisation, R&Rs, meals, accommodation costs and the applicable contractors' margin.

11.5.9 Field Indirects

The estimate includes costs for the establishment of temporary facilities required to support the on-site construction of the project.

11.5.10 Owner's Costs

Owner's Costs include the following cost elements:

- Owner's management team for project implementation.
- Owner's management team and associated costs for 'self perform' scopes of work.
- Owner's technical consultants.
- Owner's management team consumables and site support costs such as travel and accommodation.
- Offsite project office inclusive of rental, outgoings, equipment and furnishings.
- Project computing requirements.
- Project insurances including contractor's all-risk, public liability and marine insurance as well as insurance deductibles. All other insurance requirements such as professional indemnity, workers compensation and automotive etc., are deemed to be included in the discipline unit cost rates.
- Owner's overhead distributables.

11.6 Onsite Infrastructure Capital Cost Estimate

11.6.1 Onsite Infrastructure Capital Cost Summary

Table 11.7 Site Infrastructure and Bulk Earthworks Costs Summary

Description	Initial Capital Cost (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
TSF Construction Stage 1	5,292		5,292
TSF Construction Stage 2 - 10		9,967	9,967
Sediment Control	174		174
Decant System		388	388
Decant Pontoon to Tower Mechanical and Electrical Allowance		150	150
Subtotal TSF	**5,466**	**10,506**	**15,972**
Water Dams Construction	3,774		3,774
Subtotal Raw Water	**3,774**		**3,774**
Foundation improvement - Design	10		10
TSF and Raw Water Engineering and Design including Project Management	172		172
Construction Material Assessment	23		23
TSF and RW DAM Site Investigation	33		33
General Site investigation	37		37
Geotech testing Supervision	726		726
Bore hole testing	183		183
Engineering Interface and Construction Management of Bulk Earthworks	736		736
Subtotal TSF and RW Dam Engineering, Testing, Supervision	**1,919**		**1,919**
Mine Camp	169		168
Plant Site Access Road (within Mining Lease only)	735		734
Plant, Administration and Mining Contractor Laydown Pad	1,736		1,735
Bush Stripping and Clearing for Top Soil Storage Areas	103		102
Temporary Access Road for Tailings, Decant, RW lines	150		150
Subtotal Infrastructure	**2,892**		**2,892**
Foundation Improvement - SAG Mill	187		187
Foundation Improvement - CIL Tank Area	344		344
Subtotal Plant Foundation Improvement	**531**		**531**
Early Bore Development - Make up Water - Allowance	250		250
40 Person Fly Camp for Initial Construction	720		720
Subtotal Other Allowances	**970**		**970**
Subtotal Plant and Site Infrastructure	**15,552**	**10,506**	**26,058**

Table 11.8 Site Infrastructure and Bulk Earthworks Contingency Considerations

Description	Initial Capital Cost (US$,000)
Contingency Considerations	**3,111**
Bulk Earthworks Contingency	3,111

11.7 Mining Capital Cost Estimate

The information within this section has been provided by KEFI and has not been reviewed in detail by Lycopodium.

11.7.1 Basis of Estimate and Assumptions for Mine Capital Cost

The following technical documents form the basis of the capital cost estimate for mining:

- Mine design for various stages of the Tulu Kapi pit.
- Waste rock landform designs and staged development.
- Mining sequence of the Tulu Kapi pit and associated waste rock landform construction.
- The life-of-mine material movement schedule informed by the mining sequence.
- Pricing provided by the preferred contractor.
- Historical costs for minor plant and equipment or updated vendor quotations.
- Provisional sums for minor costs.

The following assumptions were made in the preparation of this estimate:

- Equipment delivery and commissioning timeframes can be achieved.
- Payments are made upon commissioning of equipment.
- Adequate space is available for large machines to be reconstructed on site.

11.7.2 Mining Infrastructure Capital Cost

Table 11.9 Mining Capital Cost Estimate Summary

Description	Initial Capital Cost (Incl. Cont.) (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
Mining Equipment / Fleet			
Equipment (incl. delivery)	527	1,097	1,624
Subtotal Mining Equipment	**527**	**1,097**	**1,624**
Capital Development			
Mining Infrastructure	1,851	-	1,851
Mining Contractor Mobilisation / Demobilisation	4,809	-	4,809
Load / Haul	729	-	729
Drill and Blast	460	-	460
Fixed Costs	2,094	-	2,094
Daywork Provision	872	-	872
Other Capital Development (Waste Dumps and ROM Pad)	2,023	-	2,023
Subtotal Capital Development	**12,838**	**-**	**12,838**
Owner's Team			
Light Vehicles Operating Costs	54	-	54
Mining Management Labour	165	-	165
Mine Technical Service Dept Labour	385	-	385
Mine Operations Labour	91	-	91
Mining Dept Overheads and Equipment	1,763	-	1,763
Subtotal Owner Team	**2,458**	0	**2,458**
Total Mining	**15,823**	**1,097**	**16,920**

11.7.3 Mining Equipment

Formal enquiries were issued to suppliers. The quotations provided underwent an adjudication process for selection of preferred supplier. This cost was thereafter used for estimation of costs. Table 11.10 gives a breakdown of equipment included in cost estimate.

Table 11.10 Mining Equipment Cost Estimate

Description	Initial Capital Cost (Incl. Cont.) (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
Light Vehicles	294	1,031	1,325
Computers and Software / Software Licensing	131	66	197
Engineering / Geology Equipment	102	0	102
Mobilisation of Explosives Contractor	0	0	0
Total Capital Development	**527**	**1,097**	**1,624**

11.7.4 Light Vehicles

The selection of light vehicles below was based on the proposed organogram for the mining department. The following vehicles were allowed for:

Table 11.11 Light Vehicle Cost

Mining Management	Single Cab Utes	Twin Cab Utes	Land Cruiser Wagon	Total
Operations Manager			1	1
Technical Services Superintendent			1	1
Mining Engineer – Production			1	1
Mining Engineer – Drill and Blast			1	1
Senior Geologist			1	1
Mine Geologist		1		1
Senior Mine Surveyor		1		1
Mine Surveyors				
Field Technicians		1		1
Mine Operations Superintendent			1	1
Mining General Supervisor		1		1
Total	**0**	**4**	**6**	**10**

11.7.5 Mining Contractor Infrastructure

The following mine facilities have been allowed for as part of the infrastructure:

- Contractor's mine office.
- Induction and training facilities.
- Contractor's Mining Equipment Maintenance workshop including tyre change bay, lube bay, light vehicle maintenance facility and secured stores facility.
- Heavy vehicle and light vehicle wash-down bay.
- Lubricant storage and dispensing facility.
- Emulsion plant construct and commission.
- Magazine facility construct and commission.
- Roads, hardstands and signs and traffic controls in and around the office and workshop facilities (excluding haul roads).

The facilities will be provided and erected by the Mining and Explosives contractors. KEFI will perform site preparation. An allowance for the site preparations has been made as part of the bulk earthworks.

11.7.6 Mining Equipment Refuelling Facility

The fuel storage facility, which is situated adjacent to the Mine workshop, will have sufficient capacity for approximately 2.5 month's supply for the mining fleet, estimated to be approximately 1050 m^3 based on an approximate consumption of 15,000 L per day, along with reserve capacity for emergency pumps and generators.

At present a proposal has been received through negotiation with a global fuel supply company to provide this facility and supply fuel (AGO - Automotive Gas Oil) and lubricant to Tulu Kapi.

The global fuel supply company is able to supply all necessary lubricants including diesel engine oil, transmission oil, steering oil, grease, brake fluid, coolant, hydraulic and gear oil, compressor oil, pneumatic tool oil, and heat transfer oil.

Based on the current proposals, the fuel supplier will provide and establish sufficient storage for an initial 150 m^3 facility at Tulu Kapi along with high flow rate dispensing pumps, services for used oil collection.

In addition the fuel supplier will ensure the necessary QC protocol on site to maintain the quality and cleanliness of fuel distribution, provide a used oil analysis service to monitor service intervals and efficiency, and used oil collection and disposal service.

Diesel fuel will be stored in double-skinned, below ground tanks in a designated fuel compound with re-fuelling station. Tanks will have an external fuel gauge and appropriate signage.

Fuel will be delivered by 40,000 L road tankers at a sufficient rate to ensure that supply is maintained.

The US$518k costs associated with establishing the bulk storage site has been included as part of the owners cost as shown in Table 11.15.

11.7.7 Mining Contractor Mobilisation

The mining contractor and explosive services contractor will mobilise to site approximately 3 to 6 months prior to plant commissioning. The majority of the earthmoving fleet required for this operation will be mobilised at this time. An increase in material movement during production will require additional contractor fleet to be mobilised to site.

11.7.8 Pre-production and Pre-strip Capital Cost

Mining pre-production allows for the generation of waste rock required for the construction of the following site infrastructure:

- Stage 1 ROM pad and stockpiling area.
- Mine access road and haul roads.
- Mine bench establishment in preparation for production.

Haul road construction also includes provision for forming the road and the placement of road base material. Compaction is expected to be achieved through movement of heavy mine vehicles over the surface.

The pre-production works also allows for clearing and grubbing and top soil removal over the borrow area, ROM pad and mine access and haul roads.

A short pre-strip phase is included in the mining costs to develop the pit and create sufficient surface stockpiles so that ore feed can be maintained to the process plant over the life of the project. It also enables certain high-grade areas to be brought forward to aid project cash flow.

11.7.9 Pit Dewatering Capital Cost Allowance

Pit dewatering will be carried out by the contractor. The contractor will provide all pumps, pipes and associated equipment. Pit water will be discharged into the Water Dam.

The costs for the pit dewatering system installation and operations have been included in the contractor’s fixed costs.

11.7.10 Explosives Supply Capital Cost Allowance

A bulk manufacturing facility and a mobile manufacturing unit will be supplied by a contractor (potentially AEL Mining Services East Africa -AEL) at a monthly rental cost.

It is proposed to set up a supply and storage site on the mine from where the bulk explosives service will be managed. The site will consist of a storage facility for chemicals, emulsion manufacturing facility and explosives magazine complex. Initially, for the first period, one twenty-five tonne Mobile Manufacturing Unit (MMU) will be deployed together with an explosives delivery vehicle.

A maintenance workshop, ablution and change house, offices and magazine will form part of the start-up phase and will be provided by KEFI.

KEFI will perform the site preparation and the civil construction as part of the construction phase and costs have been accounted for in the bulk earthworks capital cost.

11.7.11 Mobile Crushing Plant

The contractor will mobilise a crushing plant to site to crush rock for roadbase and stemming required for the open pit operations.

11.7.12 Owner’s Team

From the initiation of the project up to the commencement of processing operations, the operating costs incurred by the project are included in the capital cost estimate.

Owner’s pre-productions costs comprise the following:

- Mining department labour costs prior to commencement of production including travel.
- Vehicle running and maintenance costs.
- The cost of other administrative support.

The owner’s mining team will be mobilised to site 3 to 6 months prior to commissioning.

11.7.13 Mining Sustaining Capital

Sustaining capital provisions were included for the replacement of light vehicles every 3 to 4 years.

The contractor’s replacement capital provisions were allowed for as amortised costs in its unit rates for mining. Through discussion with the preferred contractor it is understood that major fleet will not require replacing during the life of the operation.

11.7.14 Process Plant Indirect Costs

Table 11.12 Process Plant Indirect Costs

Description	Initial Capital Cost (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
Processing Plant Indirect Costs			
Light Vehicles Plant, G&A (excluding Mining)	157		157
Other Mobile Equipment (excluding Mining)	880		880
55 t Crane	631		631
Other Construction Equipment	270		270
Subtotal Plant and Site Infrastructure	**1,938**		**1,938**

Formal enquiries were issued as part of the 2015 DFS to vehicle suppliers. The quotations provided underwent an adjudication process for selection of a preferred supplier. In 2016 KEFI revalidated the light vehicle pricing with enquiries to the market. These updated costs are reflected within this estimate.

Light Vehicles

The selection of light vehicles below was based on the proposed organogram for process plant and G&A. The following vehicles were allowed for:

- LDV – Hilux Single Cab – 4.
- LDV – Hilux Double Cab – 10.
- Land Cruiser 200 VX – 1.
- Land Cruiser 70 Troop Carrier – 2.
- Fire Truck (3500 L Water) – 1.
- Land Cruiser 70 Ambulance – 1.

Mobile Equipment

The fleet that will form part of the plant, general maintenance and stores / warehouse heavy vehicles is as follows:

- Telehandler – 1.
- Front-End Loader (Cat 938K or equivalent) – 1.
- 10 t truck with mounted crane – 1.

- Skid Steer Loader JC45G – 1.
- Crane 55 t – 1.
- Extendable Forklift – 1.
- Tractor – 1.
- Trailer – 1.

Personnel Transport

The transport listed below will be used to transport personnel from the staff camp to the mine site. Light vehicles will supplement the buses if required.

- Bus - 15 people – 2.
- Bus - 60 people – 1.

11.7.15 Process Operational and Insurance Spares

Table 11.13 Process Plant Operational and Insurance Spares

Description	Initial Capital Cost (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
First Fills (including transport)	537	-	537
Plant Operating Spares	1,750	-	1,750
Plant Insurance Spares	875	-	875
Plant Operating Consumables (1 ½ month supply)	1,176	-	1,176
Subtotal Plant and Site Infrastructure	**4,337**		**4,337**

The spares have been calculated by the application of a benchmark percentage determined from actual historical data compiled by Lycopodium Minerals Pty Ltd.

Also included in the costs are three month supply of reagents and consumables and plant first fills.

A stores / warehouse building, located on the plant infrastructure terrace, will be used to house the spare parts and consumables for the process plant. Reagent storage will have a separate area.

11.7.16 Insurance

Insurance has been estimated at US$1,750k (approximately 1.2% of the total project capital cost).

11.8 Offsite Infrastructure Capital Cost Estimate

The information within this section has been provided by KEFI and has not been reviewed in detail by Lycopodium.

11.8.1 Offsite Infrastructure Capital Cost Summary

Table 11.14 Offsite Infrastructure Costs

Description	Initial Capital Cost (US$,000)	Sustaining Capital Cost (US$,000)	Total Capital Cost (US$,000)
Overhead Grid Power Lines			
Supply and Construct Overhead Power Lines	9,812		9,812
Design and Supervision (by EEPCo)	324		324
Environmental	391		391
Subtotal Overhead Grid Power Lines	**10,527**	**-**	**10,527**
Access Roads and Airstrip			
Main Access Road	3,984		3,984
Southern Bypass Road	758		758
Northern Bypass Road		473	473
Airstrip	277		277
Airstrip Sundries – Fence, wind sock, etc	125		125
Subtotal Access Roads and Airstrip	**5,144**	**473**	**5,617**
Subtotal Plant and Site Infrastructure	**15,671**	**473**	**16,144**

11.8.2 Overhead Power Lines Capital Cost

The overhead lines will be designed and constructed generally in accordance with EEPCo code of practice.

The costs for the developed of the 47 km overhead power line connecting the mine site to the Ethiopian power grid from the 2015 DFS have been used. The quote of $11.581 million (including 10% contingency) includes supply, construction, design and supervision along with environmental costs.

Formal enquiries were issued to reputable overhead power line suppliers. The quotations provided underwent an adjudication process for selection of the preferred vendor. This cost was thereafter used for estimation of overhead power line cost. An estimate for the design has been carried out by EEPCo.

11.8.3 Access Roads Outside the Mining Concession Capital Cost

A total of 19.2 km of roads, 14.2 km site main access, 4.0 km of southern concession bypass road and 1.0 km of northern concession bypass road will be required. The cost of constructing these roads is including in the initial capital costs except for the northern bypass road which is built later and included in sustaining capital costs. The northern bypass will not be required during the development phase of the project.

The optimised route following the 2015 DFS and revised cost have been based on unpaved Design Class DS6 road for Mountainous Terrain in accordance with the Ethiopian Roads Authority's Design Manual for Low Volume Roads.

11.9 Owner's Costs and Working Capital

The information within this section has been provided by KEFI and has not been reviewed in detail by Lycopodium.

11.9.1 Owner's Cost

From the initiation of the project up to the commencement of processing operations, the operating costs incurred by the project are included in the capital cost estimate.

Owner's pre-productions costs comprise the following:

- General and administration salaries, including owner's project team, HSSE department finance, procurement and human resources.
- Mining department labour costs prior to commencement of production (included under mining owner's team).
- Plant labour costs prior to commencement of plant commissioning.
- Costs associated with the administration of an offsite office in Addis Ababa.
- Camp catering costs.
- Training package implementation and contractor engagement.
- Preparations for contractor managed and operated onsite laboratory.
- Vehicle running and maintenance costs (except mining vehicles which have been included under mining owner's team).
- The cost of other administrative support.
- Installation of bulk fuel storage facility along with high flow rate dispensing pumps and services for used oil collection.

- Exploration Camp upgrade for initial construction.

Table 11.15 Owner's Costs

Description	Initial Capital Costs (US$,000)	Sustaining Capital Cost (US$,000	Total Capital Cost (US$,000)
Owner's Costs - Site			
Owner's Project Management	1,498		1,498
G&A Labour	1,661		1,661
Processing Labour and Maintenance Labour	505		505
Owner's Project Management - Offsite Accommodation and Travel	147		147
Owner's Project Management - Catering	105		105
Assay Laboratory (Contractor Mobilisation)	245		245
Maintenance	78		78
Supplies and Spare Parts	245		245
Other Site Admin Costs	78		78
Security Contractor	315		315
Exploration Camp Upgrade	402		402
EPC Contractor Catering Cost Allowance	1,391		1,391
Mining Contractor Catering Cost Allowance	590		590
Bulk Fuel Storage Infrastructure	518		518
Training	2,000		2,000
Subtotal Owner's Cost - Site	**9,779**		**9,779**
Owner's Costs – Offsite			
Insurance	1,756		1,756
Plant indirects	1,937		1,937
Addis Office Costs (including salaries)	4,640		4,640
Subtotal Owner's Costs – Offsite	**8,333**		**9,633**
Total	**18,112**		**18,112**
Owner's Costs – Other			
Losses During Ramp Up / Working Capital	3,434		3,434
Relocation / Resettlement	10,000	830	10,830
Environmental Management	1,051		1,051
Additional Contingency	3,254		3,254
Closure Cost Provision	-	9,483	9,483
Subtotal Owner's Costs - Other	**17,740**	**10,313**	**28,053**
Total	**35,852**	**10,313**	**46,165**

11.9.2 Relocation and Resettlement Updated Capital Cost Estimate Summary

The development of the Tulu Kapi Gold Mine will require relocation of some local residents. To provide for crop compensation, property compensation, relocation, infrastructure and livelihood re-establishment $10.8 million has been allocated based on quotations, baseline studies and information available from the Ethiopian federal statistics on crop yields and market price.

Table 11.16 Relocation and Resettlement Summary and Variance from 2015 DFS

Capital Comparison	2015 DFS Total (US$,000)	2016 Estimate (US$,000)	Difference (US$, 000)
Relocation, Resettlement	7,500	10,000	2,500
Livelihood Restoration	1,245	830	-415
	8,745	**10,830**	**2,085**

KEFI engaged the services of two separate organizations, Pact and ICRAF, to audit and evaluate the Resettlement Action Plan (RAP) cost.

Pact is an international development organisation focused on livelihoods, natural resource management and health programs, working with over 10,000 partners in 25 countries. World Agro Forestry Centre (ICRAF) is also an international development organisation. Their proposed livelihood restoration programmes (LRP) have dual focus on options of agricultural intensification and diversification to support traditional farming systems and boost productivity, and ensuring landscape health and reducing environmental degradation.

A significant expenditure increase has been the inclusion of 360 residential buildings to be constructed in the resettlement areas. KEFI has committed to providing these buildings through its own initiative as these structures are not a mandatory requirement of the Ethiopian Government.

There are other minor expenditures included in the new estimate such as grave and church relocation and financial training. All the costs are based on included quotes and discussions with local businesses.

The initial timing of a portion of the 2015 DFS Livelihood Restoration expenditures has been rescheduled to be included in the 2016 initial capital requirements. The value is US$415,000.

A more detailed breakdown of the adjusted costs associated with the Relocation and Resettlement Programme is given in Table 11.17.

Table 11.17 Relocation and Resettlement Cost Breakdown

Tulu-Kapi Gold Project - Social Performance Capital Allocation				Capital Budget by Year (US$)			Total (US$) By Program
Program		Category	Breakdown	2016-2017	2017-2018	2018-2019 (Sustaining Capital Cost)	
1. RAP	A. Compensation	Compensation (inc. 20% variation based on Oct 2014 estimate from KEFI DFS RAP)	**Phase 1 Estimate**	3,291,601			
			Capacity building and resources for Woreda	50,000			
			Phase 2 Estimate		4,028,399		
			Capacity building and resources for Woreda		50,000		
			Contingency			410,000	7,830,000
	B. Relocation and Infrastructure development	Relocation logistics	Phase 1	150,000			
			Phase 2		150,000		
		Relocation of churches and graves		80,000			
		Archaeological survey		50,000			430,000
		Infrastructure development support	Construction of 360 residential buildings	350,000	350,000	100,000	
			Development of water infrastructure	200,000	50,000		
			Agricultural land preparations	250,000	50,000		
		Contingency for government provided infrastructure			200,000	50,000	1,600,000
	C. Livelihood Restoration	Financial training, capacity building and micro-finance		80,000	60,000	50,000	
		Agricultural diversification and intensification		100,000	80,000	60,000	430,000
2. Supply Chain Enterprise Development		Business Development Support		50,000	40,000	30,000	120,000
3. Social Impact Management		Influx Management Plan		40,000			
		Evaluation and monitoring			40,000		
		Provision for mitigating social impacts measures		20,000	30,000	30,000	160,000
4. Community Development		Consultation, Design, Incorporation of KEFI Foundation		40,000			
		KEFI Foundation contribution			120,000	100,000	260,000
Total By Year (US$)				**4,751,601**	**5,248,399**	**830,000**	**10,830,000**

11.9.3 Environmental Management Capital Cost Estimate

A provision has been made to further develop the Environmental Management capacity by the continuing development of management plans prior to production. An allocation to develop the environmental plans and undertake predictive modelling of TSF is given in Table 11.18.

KEFI engaged the services of Ramboll Environ (Seattle, Washington) to audit and evaluate the environmental management cost allocation used in the 2015 DFS and the provision has been adjusted accordingly.

Cost has been allocated based on budget quotations, recommendations from Ramboll Environ and the future studies required during the project implementation phase. The cost estimate has been increased from US$0.525M to US$1.051M. The significant increase is mainly due to the additional predictive modelling of TSF design to meet ICOLD, ANCOLD4, or other internationally recognised standards;

Table 11.18 Environmental Management Costs

Description	Updated Initial Capital Costs (US$,000)	2015 DFS Initial Capital Costs (US$,000)
Management of Update Baseline Studies	77	
Ecology / Biodiversity and Water Resources Monitoring	104	
Risk assessment-based review of the engineering design of the TSF and associated water management pond	200	
TSF failure analysis model for downstream impacts	80	
Predictive modelling of the TSF seepage	200	
Geotechnical Studies prior to Plant construction (allowed under Bulk Earthworks and TSF)	0	
Ground Water Characterisation and Monitoring during Construction	0	200
Waste Management Plan	100	100
Air Quality Plan	125	125
Noise and Vibration Monitoring Plan	100	100
Camp Water Quality/ Treatment Options Studies	15	
Contingency for cost escalation 5%	50	
Total	**1,051**	**525**

11.9.4 Contingency

Table 11.19 Contingency Allocation

Description	Initial Capital Cost (US$,000)	Contingency	
		%	(US$,000)
Owners Cost and Training	9,779	0%	0
Addis Office Costs	4,640	0%	0
Bulk Earthworks	14,582	Included above	Included above
Grid Power Line	10,527	10%	1,053
Access Roads and Airstrip	5,144	10%	514
Mining Capital Expenditure	15,822	10%	1,582
Environmental Management	1,051	10%	105
Plant and Related Infrastructure		Included in DDA[1]	
Relocation and Resettlement		Included in DDA[1]	
Total Cost	**54,186**		**3,255**

Note 1: DDA - Design Development Allowance

11.9.5 Closure Cost Estimate

The closure cost considers the cost of ongoing rehabilitation during the mining operations as well as the cost of closing the TSF and rehabilitation of the site.

The closure plan has been broken into four cost elements, TSF closure, waste dump, general site clean-up and a provision for equipment and suppliers to assist in the overall closure. The total provision is $9.483 million.

Table 11.20 Closure Costs

Description	Closure Costs (US$,000)
TSF Closure	6,510
Mine Waste Dump Closure	1,320
Site Clean Up	1,210
Equipment	443
Total	**9,483**

12.0 PLANT AND ADMINISTRATION OPERATING COSTS

12.1 Introduction

The process and administration operating costs have been compiled by Lycopodium based on costs developed by:

- KEFI - General and administration costs, labour costs.
- Lycopodium - Processing costs.

The estimate is considered to have an accuracy of ±15%, is presented in United States dollars (US$) and is based on information from various sources with key inputs having been updated during the first quarter of 2017 (1Q17).

12.2 LOM Operating Cost Summary

Life of mine (LOM) operating costs for the project have been calculated by applying the unit costs per ore type to the LOM ore tonnages processed in the mining schedule.

The Tulu Kapi Gold LOM operating cost estimate is summarised in Table 12.1. Operating costs are exclusive of taxes, selling and royalty's costs.

Table 12.1 LOM Operating Cost Estimate Summary (US$, 1Q17, ±15%)

Cost Centre	Total LOM Cost	
LOM Plant Feed 45.3 Mt	US$M	US$/t Plant Feed
Mining	441	28.64
Processing	133	8.67
General and Administration	88	5.69
Total	**662**	**43.00**

12.3 General Overheads – KEFI Scope

The general and administration overheads costs have been estimated by KEFI based on 2015 DFS costs and include the following ongoing operating expenses:

- Administration labour costs including site management, human relations, community relations, environmental support and occupational health and safety personnel, commercial, accounting, purchasing and payroll services, computing services, site warehouse operations and site medical personnel. The manpower has been revised for this addendum to include an experienced Expat 1 Level Operations Manager and a more experienced Expat 1 Level Health, Safety and Security Manager.

- Site office expenses including communications and communication maintenance, postage and light freight, office equipment and supplies, computer supplies and software licenses.

- Offsite office (Addis Ababa) running costs.

- A contract will be let for provision of camp food and catering costs, cleaning and maintenance of the camp and site administration buildings.

- All non-mining light vehicle operating and maintenance costs.

- Access and bypass road maintenance costs.

- Site security contract.

- Insurance expenses covering industrial special risks, third party liability, motor vehicle, bullion transport and other requirements.

- Financial expenses including banking charges, legal fees, auditing costs and accounting consultants and bullion selling. Bullion refining and royalties are considered separately.

- Personnel expenses such as first aid and medical costs, safety supplies, travel and accommodation, recruiting / relocation costs, training, recreational and local facilities costs, professional memberships and subscriptions and entertainment allowances.

- Costs such as personnel transport, protective and safety equipment, OH&S supplies, and training.

- Environmental compliance testing and water management costs. Allowances for environmental testing and monitoring were increased considerably as part of the addendum.

- Provision for ongoing closure and site rehabilitation costs.

- Community relations expenses including development fund, general expenses, community projects and scholarships.

An annual allowance of $1.2 million is made for corporate management fees. This is included in the general overhead. The average LOM general overheads cost is included in the overall operating cost estimate in Table 12.1.

12.4 Processing Operating Cost Summary

The information within this section has been compiled by Lycopodium utilising rates for labour, commodities and the like provided by KEFI.

The Tulu Kapi project will mine a range of ores from near surface saprolite (oxide) through shallow fresh low competency rock to deep hard fresh rock. The boundary for the deep ore was previously nominated as 1,600 mRL, but this was not a valid representation of the orebody characteristics. OMC adopted a geo-metallurgical approach to characterising the orebody with testwork characteristics being assigned to locations in the block model. The characteristic names have been retained, but the physical ore properties are now aligned more directly with the ore characterisation testwork.

An oxide throughput of 1.7 Mtpa with a target grind P_{80} of 125 µm has been nominated while the mill design has been based on 1.5 Mtpa of blended fresh ore feed with a target grind P_{80} of 150 µm.

The process plant availability has been nominated as 91.3% for milling and downstream operations and 80% for the crushing plant including scheduled and unscheduled maintenance. Provision for significant surge capacity ahead of the mill has been made to ensure the lower crusher availability does not affect downstream operation.

Process plant operating costs for the Tulu Kapi Gold Project were compiled from information sourced by Lycopodium and advised by KEFI:

- Grid power supply costs as advised by KEFI.
- Manning levels and pay rates advised by KEFI to suit the proposed process plant unit operations and plant throughput.
- Consumable prices sourced from supplier budget quotations and the Lycopodium database with KEFI advice of transport costs from Djibouti port to site.
- Reagent and consumption and metal recoveries based on laboratory testwork results, mill modelling and mining schedule.
- Modelling by Orway Mineral Consultants (OMC) for crushing and grinding energy and comminution circuit consumables, based on ore characteristics derived from relevant testwork.
- A contract laboratory operating cost quotation sourced by KEFI. Analysis costs cover all grade control sampling, process plant samples and environmental testing. Sample numbers and schedules were advised by KEFI.
- General and Administration costs as advised by KEFI.
- First principle estimates where required based on typical operating experience or standard industrial practice.

- Cost benchmarking with other similarly remote African projects and operations.

Operating cost detail has been sourced in US dollars, Australian dollars and South African Rand. The following exchange rates have been used for the preparation of the operating cost estimate:

- US$1.00 = A$1.32 (AUD).
- US$1.00 = R14.39 (ZAR).
- US$1.00 = ETB22.75 (Birr).

The fixed and variable components of the operating costs have been estimated by assessing the extent to which each item in each of the cost centres is a fixed or variable cost. For example, plant power draw and most of the operating consumables are variable costs with direct dependence on throughput rate, while the labour cost can be considered fixed.

The fixed / variable presentation allows assessment of processing costs in years when mined ore tonnages vary from the nominated design values.

Battery Limits

The operating costs presented include all direct processing and administration costs to allow production of gold bullion. The battery limits for the processing operating costs are as follows:

- Ore delivered to the ROM bin. Costs for the ROM pad FEL to load material to the process plant ROM bin are included in the mining costs. Crushed ore reclaim from the dead stockpile to the plant feed surge bin is also in the mining costs. Dead stockpile management is also a mining cost.
- Tailings discharge from the tails pipeline to the tailings storage facility (TSF).
- Gold bullion in plant goldroom safe.
- All required reagents and consumables being available from the plant stores.
- Sufficient clean water supply (rainfall run-off) to the water dam.
- Reliable grid power supply a 132 kV to the HV transformer secondary terminals.

Qualifications

The operating cost estimate presented in this section is exclusive of the following:

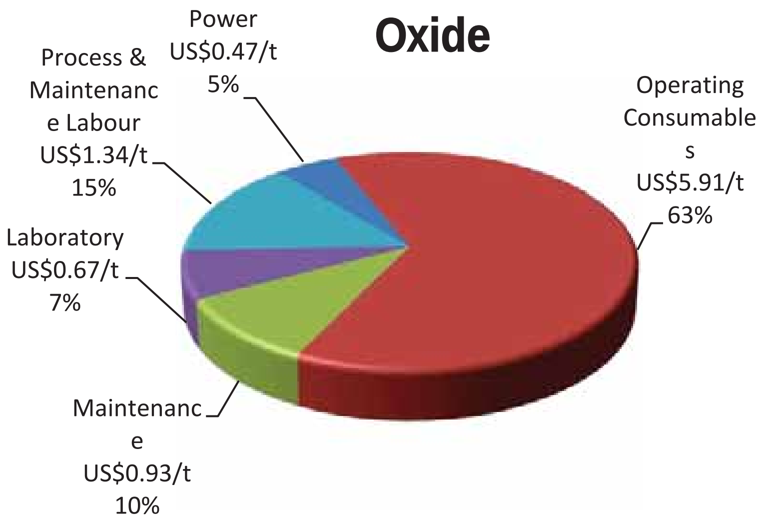
- All costs associated with areas beyond the battery limits of Lycopodium’s scope of work.
- Any impact of foreign exchange rate fluctuations.
- Any escalation from the date of the estimate.

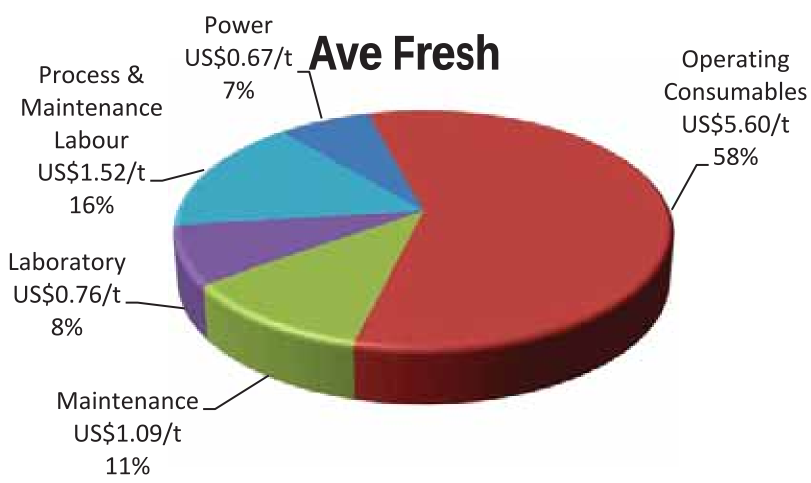
- Any contingency allowance.
- All withholding taxes and other taxes. KEFI advises that the project will be exempt from all Ethiopian taxes and duties.
- Gold refining and bullion transport and in-transit security of gold from site.
- Tailings storage facility future lifts, site rehabilitation and closure costs (accounted for separately in owner's capital costs).

Table 12.2 Processing Operating Cost Estimate Summary (US$, 1Q17, ±15%)

Cost Centre	Oxide		Ave Fresh		Shallow Fresh		Deep Fresh	
	US$/y	US$/t	US$/y	US$/t	US$/y	US$/t	US$/y	US$/t
Power	796,997	0.47	1,001,543	0.67	875,576	0.58	1,106,515	0.74
Operating Consumables	10,051,583	5.91	8,406,576	5.60	7,808,913	5.21	8,936,455	5.96
Maintenance	1,589,119	0.93	1,630,723	1.09	1,609,601	1.07	1,648,324	1.10
Process & Maintenance Labour	2,285,946	1.34	2,285,946	1.52	2,285,946	1.52	2,285,946	1.52
Total Processing	14,723,645	8.66	13,324,787	8.88	12,580,037	8.39	13,977,239	9.32
Administration Labour	2,846,468	1.67	2,846,468	1.90	2,846,468	1.90	2,846,468	1.90
General and Administration Costs	4,610,894	2.71	4,610,894	3.07	4,610,894	3.07	4,610,894	3.07
Laboratory	1,140,326	0.67	1,140,326	0.76	1,140,326	0.76	1,140,326	0.76
Total G&A	8,597,688	5.06	8,597,688	5.73	8,597,688	5.73	8,597,688	5.73
Total	**23,321,333**	**13.72**	**21,922,475**	**14.61**	**21,177,725**	**14.12**	**22,574,928**	**15.05**

Exclusions: All Mining Costs





12.4.2 Power

The power cost estimate has been based on grid power at a unit cost of US$0.02/ kWh as advised by KEFI based on the published Ethiopian Electric Power Corporation tariff. The average continuous power draw and power cost for the LOM blend by plant area is summarised in Table 12.3.

An estimate of the power cost for the Mine Services Area (MSA) is included in the processing operating cost. The power cost for the accommodation camp and other remote site facilities is also included in the operating cost.

Table 12.3 Processing Power Cost Summary (US$, 1Q17, ±15%)

Area	Average Continuous Draw (kW)			Total Power Cost (US$)		
	Oxide	**Shallow Fresh**	**Deep Fresh**	**Oxide**	**Shallow Fresh**	**Deep Fresh**
Primary Crushing	157	157	157	27,475	27,475	27,475
Reclaim	64	64	64	11,274	11,274	11,274
Grinding Energy	1,863	2,311	3,629	326,314	404,893	635,831
Milling, Classification (excl grinding energy)	269	269	269	47,129	47,129	47,129
CIL	402	402	402	70,471	70,471	70,471
Elution and Goldroom	60	60	60	10,497	10,497	10,497
Cyanide Destruction and Tails Disposal	167	167	167	29,309	29,309	29,309
Reagents and Fuel	10	10	10	1,678	1,678	1,678
Water Systems	233	233	233	40,735	40,735	40,735
Air Systems	249	249	249	43,636	43,636	43,636
Plant Buildings and Workshops	326	326	326	57,115	57,115	57,115
Decant Return	99	99	99	17,300	17,300	17,300
Processing Total	**3,898**	**4,347**	**5,665**	**682,934**	**761,513**	**992,452**
Processing Total Cost, US$/t				**0.40**	**0.51**	**0.66**
Processing Fixed Cost, US$/y				**297,875**	**297,875**	**297,875**
Processing Variable Cost, US$/t				0.23	0.31	0.46
Plant Services	16	16	16	2,725	2,725	2,725
Tailings Facility	1	1	1	155	155	155
Raw Water Supply	99	99	99	17,300	17,300	17,300
Mine Services Area	128	128	128	22,507	22,507	22,507
Camp and Offices	407	407	407	71,375	71,375	71,375
Infrastructure Total	**651**	**651**	**651**	**114,063**	**114,063**	**114,063**
Infrastructure Total Cost, US$/t				**0.07**	**0.08**	**0.08**
Infrastructure Fixed Cost, US$/y				**114,063**	**114,063**	**114,063**
Infrastructure Variable Cost, US$/t				0.00	0.00	0.00
Processing and Infrastructure Total	**4,549**	**4,998**	**6,316**	**796,997**	**875,576**	**1,106,515**
Processing and Infrastructure Total Cost, US$/t				0.47	0.58	0.74
Processing and Infrastructure Fixed Cost, US$/y				**411,938**	**411,938**	**411,938**
Processing and Infrastructure Variable Cost, US$/t				**0.23**	**0.31**	**0.46**

The power consumption for the SAG mill has been modelled by OMC based on a geo-metallurgical application of the mineralised materials properties to the resource. The power consumption for the remainder of the plant has been estimated from typical load factors and running hours for the installed drives selected for the process plant mechanical equipment.

The 2015 DFS power draws were correctly estimated at approximately 3.5 MW for the plant and services and 2.8 MW for grinding, but the power costs were incorrectly calculated and are approximately $0.20/ t too low. The lower milling power in the addendum costs is expected with the coarser grind size selected. Diesel fired rather than electric heating is proposed for the elution and regeneration circuits further reducing the average power drawn.

12.4.3 Operating Consumables

Costs for processing operating consumables, including reagents, crusher and mill liners, fuels and process supplies have been estimated and are summarised by ore type in Table 12.4. Consumable costs are considered 100% variable. Consumables consumption and cost detail for the three mineralised material types is included in Appendix 12.1.

Table 12.4 Processing Operating Consumables Cost Summary (US$, 1Q17, ±15%)

Plant Area	Oxide		Shallow Fresh		Deep Fresh	
	US$	US$/t	US$	US$/t	US$	US$/t
Crusher Liners	203,736	0.12	359,134	0.24	215,725	0.14
Mill Liners and Consumables	606,710	0.36	826,503	0.55	1,242,022	0.83
Grinding Media	582,583	0.34	1,296,882	0.86	2,152,314	1.43
Quick Lime	1,998,293	1.18	218,880	0.15	218,880	0.15
Cyanide - CIL	1,989,671	1.17	1,298,176	0.87	1,298,176	0.87
Activated Carbon	211,172	0.12	207,125	0.14	207,125	0.14
Elution and Refining	853,610	0.50	787,465	0.52	787,465	0.52
CN Detox	3,572,807	2.10	2,781,597	1.85	2,781,597	1.85
Water Treatment, Other	33,001	0.02	33,151	0.02	33,151	0.02
Total Cost	**10,051,583**	**5.91**	**7,808,913**	**5.21**	**8,936,455**	**5.96**

The consumption of reagents and other consumables has been calculated from laboratory testwork and comminution circuit modelling or has been assumed based on experience with other operations. No additional allowance for process upset conditions and wastage of reagents has been made.

Reagent costs CFR Djibouti port has been sourced from budget quotations and in-house data relating to similar projects in the region. Transport costs to site have been added per KEFI advice.

Cyanide destruction cost has been based on the Inco Air / SO_2 method, with the treatment of CIL tailings containing 110 g CN_{WAD}/ m^3 to ensure a maximum discharge concentration of 50 g CN_{WAD}/ m^3 after cyanide destruction.

A diesel price, delivered to site, of US$0.62 per litre has been used for process heating requirements. Diesel usage for carbon treatment and the gold room has been calculated from first principles.

Allowances have been made for mill lubricants, water treatment reagents and operator supplies.

Overall unit costs estimated are similar to those for the 2015 DFS; however this results, because the grinding consumables usage is lower with the lower specific energy required to achieve the coarser grind size. Quoted supply costs for reagents, most notably cyanide and detox reagents, are higher and allowances have been made for the necessary cyanide solution residual loss and the destruction of the total cyanide residual thereby increasing these costs significantly (these appear to have been omitted previously).

12.4.4 Maintenance Materials Costs

The plant maintenance cost allowance has been factored from the capital supply cost using factors from the Lycopodium database.

The allowance covers mechanical spares and wear parts, but excludes crushing and grinding wear components, grinding media and process consumables which are allowed for in the operating consumables cost.

The maintenance cost excludes payroll maintenance labour which is included in the labour cost. Contract labour has been allowed to assist with mill liner changes and plant shutdowns.

Allowances for plant building maintenance and general infrastructure maintenance expenses have been made.

General maintenance expenses include specialist maintenance software licences, maintenance manuals and ongoing control system service fees.

This maintenance estimate covers additional areas that were neglected in the 2015 DFS such as contract labour and general maintenance management costs, but with similar factors for cost of supplies and spares, the costs should be more equivalent. The 2015 DFS estimate appears to underestimate costs as well as omit maintenance to areas such as platework which requires relining and repair and aspects such as control system maintenance and updates and general plant condition maintenance such as painting.

12.4.5 Labour

The labour rates, manning levels and rosters used to determine the labour operating cost estimate were advised by KEFI based on the 2015 DFS. Benchmarking with Tanzanian projects and other similar operations indicates that labour costs allowed are appropriate.

The labour costs and manning numbers for plant operations and maintenance are summarised in Table 12.5.

Table 12.5 Process Plant Personnel and Annual Cost (US$, 1Q17, ±15%)

	Staff Personnel	Annual Cost US$/year	International Expatriate	Regional Expatriate	Regional Ethiopian	Local Ethiopian	Contract	Total
Administration	89	2,846,468	3	6	47	33	138	227
Plant Operations	63	1,294,133	0	12	21	30	37	100
Plant Maintenance	58	991,813	0	6	36	16	0	58
Total	**210**	**5,132,414**	**3**	**24**	**104**	**79**	**175**	**385**
Total Cost, US$/t		**3.02**						

* Contract manning includes catering, cleaning, security and laboratory services.

The overall labour numbers have changed little since the 2015 DFS, but there is an increased number of expatriate positions with a view to elevating national staff to these roles once operations have been stabilised and the incumbents demonstrate job proficiency.

The processing labour cost includes all labour costs associated with plant operations and maintenance personnel. Administration labour includes the site based management team as well as finance, HR, HSE, logistics and purchasing personnel. The tabulated labour cost excludes all mining personnel and mining contractors (included in the Mining costs) and any head office based administration personnel (included in the general overheads costs).

Labour costs will decrease marginally after Year 3 as it is intended that national employees should fill more senior roles once they become proficient in their area.

Contracts will be let for site security, camp cleaning and catering and operation of the site laboratory. Contract management and senior personnel will be housed in the camp with labour being sourced locally.

The estimate of the labour contingent has been based on a four shift operation (three shifts working 8 hours per day, one rotation shift), to provide continuous coverage for the plant operation with additional personnel allowed for leave and absenteeism coverage.

Unit rates for labour have been provided by KEFI and include the base salary and an overheads allowance. The overhead cost includes allowances for expatriate and national travel, medical health insurance, life and disability cover, leave provisions and annual bonuses. Camp and transportation costs for the workforce are excluded from the labour cost as they are included in the G&A cost estimated by KEFI.

12.4.6 Laboratory Costs

A contract laboratory will provide sample preparation and assay services for plant and environmental samples and one hundred mine grade control samples per day.

Laboratory costs have been based on a detailed quotation based on proposed sample numbers from grade control, plant and environmental. The laboratory cost includes for the supply of the laboratory equipment, mobilisation and all ongoing costs (laboratory labour, equipment and consumables) comprising a minimum monthly spend and a variable cost related to the sample assay costs. The laboratory building is included in the contractor mobilisation.

12.4.7 Services and Utilities

Water Supply

The raw water supply will be from rainfall runoff collected in dams required to minimise inflows to the tailings impoundment. Costs are based on operation and maintenance of the water supply pumps and pipeline.

Water supply costs have not been estimated separately as they have been included in the other cost centres:

- Water supply pumping power is included in the power cost.
- Maintenance costs associated with water supply are included in the maintenance cost.
- No dedicated operations labour is required for the water supply.

The consumables cost estimate includes allowances for the treatment of elution water and potable water and for the addition of anti-scalant to both the decant return and the elution water.

12.4.8 Processing Preproduction and Working Capital Costs

The pre-production costs incurred by operations during the latter stages of construction and commissioning are included in the capital cost estimate. The pre-production cost estimate is based on treating 100% oxide for the initial six weeks of operation.

Pre-Production Labour

Pre-production labour costs reflect the need to recruit key operating personnel in time for them to set up and establish operating procedures and undergo training as required. It is envisaged that manning build-up will commence eight months ahead of plant start-up.

First Fill Reagents and Opening Stocks

Costs have been allowed to purchase the consumables and reagents required for the first fill and opening stocks. The first fill and opening stock estimates are provided in Appendix 12.1.

Sufficient first fill reagents and consumables were estimated to fill the reagent tanks, charge the mills with media, add the carbon inventory to the CIL circuit and meet the other plant consumable requirements. Opening stocks refer to the purchase of the reagents and consumables required to sustain the operations for six weeks, which is the minimum on-site start-up storage quantity nominated by KEFI to avoid disruption of supply.

Quantities allowed have been based on either consumption over the minimum period or minimum shipping quantities, considering package size.

Vendor Representatives

These costs allow for specialist vendor representatives to oversee commissioning of their equipment and include allowances for labour, airfares and expenses.

Training

The training allowance covers the cost of providing pre-production training for operations and maintenance staff, but not their salaries as these are covered in the pre-production labour costs. Further allowances are made in the G&A costs for ongoing operator training and staff development.

Working Capital

Working capital covers the cost of operating the plant before the first revenue is received from bullion sales.

The basis of the process working capital calculation is six weeks of plant operations based on treating 100% oxide material at 80% of the design throughput rate. This period allows for initial ramp up to bullion production, shipping to the refiner and typical payment terms.

13.0 PROJECT IMPLEMENTATION SCHEDULE

13.1 Basis

The Tulu Kapi project is an infrastructure intensive project and as such the associated activities form the basis of the critical path as shown in the schedule contained in Appendix 13.1.

The schedule provides for early works commencing in April 2017 with the upgrade of the construction camp and the preparation, tender, negotiation and award of the environmental study, geotechnical assessment, hydrology assessment so that the reports can be provided by November 2017 as a driving predecessor to the design activities.

A key risk that was identified during the design of the Water Dams is the risk of availability of water required for start-up should there be a 1 in 100 year rain wet season. As a mitigation measure the construction has been sequenced so as to allow two wet seasons for the collection and storage of water. The design of the Water Dams is scheduled to commence in Q3 2017 with construction starting Q4 2017 enabling completion of the dam before the start of the first wet season in May 2018.

An opportunity exists in the next phase of the project and once further geotechnical investigation has occurred, to rationalise bulk earthworks in terms of maximising the cut to fill ratio and the use of imported fill, and maximising the execution approach.

The remainder of the project, and in particular the process plant, has been scheduled with a typical approach for this type of processing facility, with the engineering commencing in Q4 2017 and commissioning in November 2019.

The overall project duration is approximately 30 months being a 6 months early works programme and 24 months duration for the main portion of the EPC.

The Preliminary Baseline Schedule attached in Appendix 13.2.

APPENDIX 6.1

PROCESS DESIGN CRITERIA

KEFI MINERALS

KEFI MINERALS ETHIOPIA PLC

TULU KAPI GOLD PROJECT

PROCESS DESIGN CRITERIA AND MASS BALANCE AND PLANT WATER BALANCE

Lycopodium

1953-000-PRPDC-0001

August 2016

B	23.08.2016	ISSUED FOR FEED			
A	08.07.16	ISSUED FOR INTERNAL / CLIENT REVIEW	pp DG	DG	pp DG
REV	DATE	DESCRIPTION OF REVISION	BY	DESIGN APPROVAL	PROJECT APPROVAL

		Units	Rev	Source	Ref
KEFI	KEFI Minerals Ethiopia Reference Documents / Advice				
Agreed	Agreement of Meeting Between Owner and Lycopodium				
Test	Metallurgical Testwork				
Cons OMC	Orway Minerals Consultants				
Lyco	Lycopodium Experience				
Industry	Generally Accepted Practice				
Calc	Calculated From Given Data				
Vendor	Vendor Recommendations or Standard Specifications				
Assume	Assumption Requiring Verification				

Disclaimer:

Data stated in the Process Design Criteria and Process Mass Balance is used for design purposes only and is not a statement of predicted plant performance. Whilst it is intended that the plant shall be operated at conditions detailed in the Design Criteria and Mass Balance, no contractual commitment to this effect is implied or intended.

Note: The SI system of units is used throughout the Process Design Criteria

Note: Gas flow rates in Nm^3/h are based on a molar volume of 22.415 m^3/kg mol (at 273.15K and 101.325 kPaA).

1.0 SITE CHARACTERISTICS

		Rev	Source	Ref
Location	Ethiopia	A	KEFI	1
	See site datasheet 1953-000-GEDAS-0001	A	Lyco	1

2.0 ORE AND WATER CHARACTERISTICS

Ore

		Units	Oxide	Shallow Fresh	Deep Fresh	Rev	Source	Ref
Ore Source					Open Pit	A	KEFI	1
Plant Throughput ROM		dry t/a	1,700,000	1,500,000	1,500,000	A	Agreed	
Crushing Circuit Design Throughput	Design	dry t/a	1,700,000	1,500,000	1,500,000	A	Agreed	
Ore grade - design	Au	g/t	2.66	3.05	3.05	B	KEFI	13
	Ag	g/t	1.40	1.40	1.40	B	KEFI	13
Moisture - design		%	5.0	5.0	5.0	B	KEFI	
Bulk density		t/m^3			1.6	B	KEFI	1
Dry SG	Design		2.70	2.68	2.73	B	KEFI	3
Angle of Repose	Design	°	35	35	35	A	Industry	
Angle of Withdrawal	Design	°	60	60	60	A	Industry	
Angle of Surcharge	Design	°	20	20	20	A	Industry	
Overall Gold Extraction	Design	%	97	96	96	B	KEFI	1
Overall Silver Extraction	Design	%	96	84	84	B	KEFI	1

Design Comminution Parameters

		Units	Oxide	Shallow Fresh	Deep Fresh	Design Blend	Rev	Source	Ref
Proportion of LOM			6.2%	65.5%	28.4%		A	KEFI	9
Design Blend				To be based on limiting value for oxide or fresh ore			A	Agreed	
Crusher work index	Range	kWh/t	8.2	11.4	12.9		B	KEFI	
	Design	kWh/t	8.2	11.4	12.9		B	KEFI	3
Unconfined compressive strength	Range	MPa					B	KEFI	
Abrasion index	Design		0.3140	0.390	0.652	0.384	B	KEFI	3
Axb	Range						B	KEFI	
	Design		112	82.0	39.0	45.7	B	KEFI	3
SG	Range		2.71	2.84	2.84		B	KEFI	
Bond rod mill work index	Range	kWh/t					B	KEFI	
	Design	kWh/t	11.3	12.2	19.7		B	KEFI	3
Bond ball mill work index	Range	kWh/t					B	KEFI	
	Design	kWh/t	15.5	15.5	18.0	15.5	B	KEFI	3
Specifc Energy	Design	kWh/t				17.7	B	Lyco	15
	Turn Down	kWh/t				13.0	B	Lyco	15

Apparent Viscosity

B KEFI 5

Shear Rate	Slurry Viscosity (cps) Oxide natural pH			
(sec^{-1})	40% w/w	50% w/w	60% w/w	70% w/w
4.2	0	0	599	3780
7.4	0	0	425	3314
13.1	0	0	300	2508
21.9	0	0	201	1981
38.9	0	44	129	1422
67.4	23	40	107	1010
119.2	33	49	108	771
209.5	54	68	122	554

Shear Rate	Slurry Viscosity (cps) Oxide pH - 10.5			
(sec^{-1})	40% w/w	50% w/w	60% w/w	70% w/w
4.2	0	0	449	4229
7.4	0	0	319	3888
13.1	0	0	216	2976
21.9	0	0	144	2441
38.9	0	36	186	1435
67.4	21	40	110	898
119.2	32	51	108	686
209.5	50	70	117	574

Lycopodium

Client	KEFI Minerals Ethiopia PLC	Date	23-Aug-16	Revision	B
Project	Tulu Kapi Gold Project			Prepared	DG
Document	PROCESS DESIGN CRITERIA	Job Number	1953	Checked	LS

	Units	Rev	Source	Ref
		B	KEFI	5

Shear Rate (sec^{-1})	Slurry Viscosity (cps) FRESH natural pH 40% w/w	50% w/w	60% w/w	70% w/w
4.2	0	0	0	1797
7.4	0	0	0	1423
13.1	0	0	0	1044
21.9	0	0	0	761
38.9	0	0	57	582
67.4	16	26	68	436
119.2	29	40	83	369
209.5	48	56	113	382

Shear Rate (sec^{-1})	Slurry Viscosity (cps) FRESH pH - 10.5 40% w/w	50% w/w	60% w/w	70% w/w
4.2	0	0	0	3107
7.4	0	0	0	2847
13.1	0	0	132	2304
21.9	0	0	100	1464
38.9	0	0	73	1095
67.4	19	28	84	742
119.2	32	47	88	684
209.5	52	70	115	480

Shear stress values < 30 Pa for slurry solids up to 60 % w/w for both oxide and fresh ore. A Test 5,2

CIL Circuit Design Parameters

		Units	Oxide	Fresh	Design	Rev	Source	Ref
Fleming Kinetic Constants, Au	Carbon							
k		h^{-1}	150	150	150	B	KEFI	
n			0.60	0.60	0.60	B	KEFI	

Water

Parameter	Units	Design	Rev	Source	Ref
Type		Raw Water	B	KEFI	14
pH		7.3	B	KEFI	14
Specific Gravity		1.00	B	KEFI	14
Temperature	°C	24.6	B	KEFI	
Turbidity	NTU	121.0	B	KEFI	
Electric conductivity	u.s/cm	97.8	B	KEFI	
Total dissolved solids (TDS)	ppm	48.9	B	KEFI	
Suspended solids	mg/l	98.0	B	KEFI	
Total Amonia, NH3 as N	mg/l	0.1	B	KEFI	
Phosphate, PO_4^{-3}, reactive	mg/l	0.22	B	KEFI	
Sulphide	mg/l	0.09	B	KEFI	
Chloride	mg/l	33.0	B	KEFI	
Fluoride	mg/l	0.79	B	KEFI	
Nitrate	mg/l	13.8	B	KEFI	
Nitrite as N	mg/l	0.02	B	KEFI	
Hydroxide alkalinity (OH^-)	mg/l	0.0	B	KEFI	
Carbonate	mg/l	0.0	B	KEFI	
Bicarbonate	mg/l	97.0	B	KEFI	
Total alkalinity	mg/l	97.0	B	KEFI	
Silica	mg/l	35.9	B	KEFI	
Sulphate	mg/l	12.0	B	KEFI	
Total Nitrogen	mg/l	0.0	B	KEFI	
Total phosphorus as P	mg/l	15.5	B	KEFI	
COD	mg/l	39.0	B	KEFI	
Phosphate, PO4-3, poly	mg/l	47.5	B	KEFI	
Phenol	mg/l	0.08	B	KEFI	
BOD5	mg/l	26.0	B	KEFI	
Calcium	mg/l	17.03	B	KEFI	
Iron (Fe)	mg/l	2.52	B	KEFI	
Potassium	mg/l	2.11	B	KEFI	
Managanese	mg/l	0.62	B	KEFI	
Sodium	mg/l	13.52	B	KEFI	
Zinc	mg/l	0.10	B	KEFI	
Alumnium	µg/l	1,727.5	B	KEFI	
Silver	µg/l	1.02	B	KEFI	
Beryllium	µg/l	0.65	B	KEFI	
Cadimium	µg/l	0.13	B	KEFI	
Cobalt	µg/l	3.86	B	KEFI	
Chromium	µg/l	60.75	B	KEFI	
Magnesium	mg/l	5.71	B	KEFI	
Copper	µg/l	3.87	B	KEFI	
Nickel	µg/l	21.21	B	KEFI	
Lead	µg/l	1,730	B	KEFI	
Mercury	µg/l	1.93	B	KEFI	
Arsenic	µg/l	1.70	B	KEFI	
Gold	µg/l	2.85	B	KEFI	
Lithium	µg/l	2.65	B	KEFI	
Titanium	µg/l	47.03	B	KEFI	
Strontium	µg/l	63.1	B	KEFI	
Total coliform	CFU/100ml	9,000	B	KEFI	
Faecal coliform	CFU/100ml	1,658	B	KEFI	

			Units				Rev	Source	Ref
3.0 OPERATING SCHEDULE									
	Scheduled working days		d/a			365	A	KEFI	1
CRUSHING PLANT OPERATION									
	Operating hours per day		h			24	A	KEFI	1
	Operating days per year		d			365	A	KEFI	1
	Operating hours per year		h			7,008	A	Lyco	
	Availability		%			80.0		Calc	
	Feed rate	Operating	dry t/h	243	214	243		Calc	
		Design	dry t/h	243	214	243		Calc	
		Design	wet t/h	255	225	255		Calc	
MILLING PLANT OPERATION									
	Operating hours per day		h			24	A	KEFI	1
	Operating days per year		d			365	A	KEFI	1
	Operating hours per year		h			8,000	A	Lyco	
	Availability		%			91.3		Calc	4
	Feed rate	Operating	dry t/h	213	188	213		Calc	
		Operating	wet t/h	224	197	224		Calc	

4.0 CRUSHING AND RECLAIM

			Units	Oxide	Fresh	Design	Rev	Source	Ref
Run of Mine (ROM) ore will be trucked from the pit to the ROM pad and dumped either on the ROM pad to be reclaimed by FEL and loaded to the ROM Bin or direct tip via a Cat 777. The ore will be crushed by a primary jaw crusher and conveyed to a surge bin.							B	KEFI	
Crushing Circuit						Single Stage Crushing	B	KEFI	
Truck	Type					Cat 777	A	KEFI	
	Capacity		t			92	A	Vendor	
Loader	Type					Cat 988 or equivalent	B	KEFI	
	Capacity		t			9	B	Vendor	
Ore	ROM Top Size	F_{100}	mm			800	A	KEFI	1
	ROM PSD (Assumed for Modelling)	F_{100}	mm	800	800	800	B	KEFI	3
		F_{80}	mm			444	A	KEFI	3
		F_{50}	mm			170	A	KEFI	3
		F_{20}	mm			32	B	KEFI	3
ROM Bin Feed						Direct Tip or Loader Feed	B	KEFI	
Grizzly	Type					Removable Static Grizzly	A	Lyco	
	Plant Top Size Limit		mm	700	700		B	Lyco	
	Aperture		mm			700 x 700	A	Lyco	
ROM Bin	Required Minimum Capacity	Trucks	No.			1.5	A	Lyco	
			m^3			86		Calc	
	Selected Capacity		m^3			120	A	Lyco	
			t			192	A	Calc	
			mins	47	54			Calc	
Primary Feeder									
	Type					Apron Feeder	A	Lyco	
	Throughput	Operating	dry t/h	243	214	243		Calc	
		Operating	wet t/h	255	225	255		Calc	
ROM Grizzly									
	Type					Vibrating Grizzly	B	Lyco	
	Required Capacity	Operating	dry t/h	243	214	243		Calc	
	Recommended Size		mm			1,400 x 4,800	B	Lyco	
		Aperture	mm			75 mm slot	A	Lyco	
	Selected Capacity	Operating	dry t/h	243	214			Calc	
	Selected Size		mm			1,400 x 4,800	A	Lyco	
		Model				LH 48/14	A	Lyco	
		Aperture	mm			75 mm slot	A	Lyco	
	Oversize		%	100	100		A	Lyco	
		Operating	dry t/h	243	214	243		Calc	
Primary Crusher				Oxide	Fresh	Design			
	Type					Jaw	B	KEFI	
	Recommended Size		mm			Metso C120 or equivalent	B	KEFI	
			mm			1,200 x 870	A	Vendor	
	Selected Size		mm			Metso C120	A	Vendor	
			mm			1,200 x 870	A	Vendor	
	Feed rate	Operating	dry t/h	243	214			Calc	
	Crusher CSS		mm			121	B	KEFI	3
	Crusher product size	P_{100}	mm			210	B	KEFI	3
		P_{80}	mm			122	B	Vendor	
Overall Crushing Circuit Product									
	Ore Type			Oxide	Shallow Fresh	Deep Fresh	A	KEFI	
	Crushing Circuit Total Product	P_{80}	mm	54	120	120	B	KEFI	
Primary Crusher Discharge Conveyor									
	Capacity	Operating	dry t/h	243	214	243		Calc	
			wet t/h	255	225	255		Calc	
	Maximum lump size		mm	210	210	210		Calc	

			Units				Rev	Source	Ref
Surge Bin Feed Conveyor									
	Capacity	Operating	dry t/h	243	214	243		Calc	
			wet t/h	255	225	255		Calc	
	Crushed Ore	P_{100}	mm	210	210	210	B	KEFI	
		P_{80}	mm	54	120	120	B	KEFI	3
Ore Storage									
	Type					Surge Bin with overflow to stockpile	A	Lyco	
			m^3			50	A	Lyco	
	Capacity	Live	t			80		Calc	
		Based on mill feed	mins	23	26			Calc	
Stockpile Feed Conveyor									
	Capacity	Operating	dry t/h	243	214	243		Calc	
	Crushed Ore	P_{100}	mm	210	210	210		Calc	
Stockpile	Type					Dead Stockpile	A	Lyco	
	Capacity (under conveyor)	Nominal	dry t			500	A	Lyco	
		Mill feed	h	2.4	2.7				
	Capcacity (total after dozing to sides)		h			24	A	KEFI	
		Fresh Ore	dry t			4,500		Calc	
Reclaim Feeder									
	Type					Apron Feeder	A	Lyco	
	Capacity	Operating	dry t/h	213	188	213		Calc	
			wet t/h	224	197	224		Calc	
	Maximum lump size		mm	210	210	210		Calc	
Mill Feed Conveyor									
	Capacity	Operating	dry t/h	213	188	213		Calc	
			wet t/h	224	197	224		Calc	
	Maximum lump size	F_{100}	mm	210	210	210		Calc	
		F_{80}	mm	54	120	120		Calc	
Lime Silo									
	Storage method	Type				Silo	A	Lyco	
	Storage capacity	Capacity	dry t			5	A	Agreed	
		Nominal	h	12	103			Calc	
Lime Feeder	Lime Addition Rate	Nominal	dry kg/h	428	49	428		Calc	

5.0 GRINDING

A single stage milling circuit will be utilised. The mill will operate as a grate discharge single stage SAG mill with layout provision for a future pebble crushing circuit (SS SAC). A KEFI

Crushed ore and water will be fed to the mill and will discharge via a trommel. Trommel oversize will pass to a scats bunker. Layout provision will be made for a future pebble crushing circuit returning crushed pebbles back onto the mill feed conveyor. The mill will operate in closed circuit with hydrocyclones, with cyclone underflow reporting to the mill feed. Cyclone overflow will gravitate to the trash screen for grit and woodchip removal. A Agreed

			Units	Oxide	Fresh	Design	Rev	Source	Ref
Milling Circuit									
	Target Product Size	P_{80}	micron	150	150	150	A	KEFI	
Primary Mill									
	Type					SSAG	B	KEFI	11
	Discharge					Grate Discharge	B	KEFI	11
	Size	Diameter	m			6.70	B	Lyco	12
		EGL	m			6.20	B	Lyco	12
		Diameter	ft			22.0		Calc	
		EGL	ft			20.3		Calc	
		Installed	kW			4,600	B	Lyco	11
		Pinion Power - Nominal	kW			3,320	B	Lyco	12
		Pinion Maximum	kW			4,360	B	Lyco	12
	Speed	Range	%Nc			60 - 80	B	Lyco	11
		Nominal	%Nc			75	B	Lyco	11
	Mill Specific Energy	Design	kWh/t			17.7	B	Lyco	11
	Ball Charge	Duty	%			11	B	Lyco	11
		Maximum	%			16	B	Lyco	11
	Total Load	Duty	%			25	B	Lyco	11
		Maximum	%			35	B	Lyco	11
	Ball size, max	Oxide Ore	mm			80	B	Lyco	11
	Mill discharge % solids		% w/w			75	B	Lyco	11
Pebble Dewatering									
	Type					Trommel	A	KEFI	
	Screen Deck					Rubber	A	Lyco	
	Trommel Spray Water		m^3/h			20	B	Lyco	
Cyclone Feed Pumps		Design	t solids/h	744	938	938		Calc	
			t water/h	436	484	484		Calc	
			t slurry/h	1,180	1,421	1,421		Calc	
			m^3/h	712	833	833		Calc	
			% w/w	63.0%	66.0%			Calc	
			slurry SG	1.66	1.71			Calc	
Classifying Cyclones				Oxide	Fresh	Design			
	Target product size	P_{80}	micron	150	150	150		Calc	
	Circulating load, % of new mill feed	Design	%	250%	400%		A	Lyco	
	Classification % Solids	Feed	% w/w	63.0%	66.0%			Calc	
		Overflow	% w/w	46.0%	46.0%		A	Lyco	1
		Underflow	% w/w	74.0%	74.0%		A	Lyco	
	Operating pressure		kPag	67	65		A	Lyco	
	Size		mm	400	400	400	A	Lyco	
	Operating	Duty	No.	6	6	6	B	Lyco	
		Standby	No.	1	1	1		Calc	
		Total installed cyclones	No.	7	7	7	A	Lyco	
		Blanked Ports	No.	1	1	1	A	Lyco	
		Total ports on cluster	No.	8	8	8	A	lyco	

Section	Item	Qualifier	Units	Oxide	Fresh	Design	Rev	Source	Ref
6.0 GRAVITY CONCENTRATION CIRCUIT									
Space will be provided for a potential future gravity circuit, but a gravity circuit is not included in the project scope.							A	Lyco	
7.0 TRASH SCREENING									
The trash screen will be fitted with replaceable wedgewire panels to meet the screening duty while treating oxide ore at higher throughput rates.							A	Lyco	
Trash Screen									
	Type					Vibrating	A	Lyco	
	Screen deck					Wedgewire panels on oxide ore and polyurethane panels on primary ore	A	Lyco	
	Aperture		mm			0.63 mm x 12 mm (polyurethane), cross flow	A	Lyco	
	Screen Feed	Slurry incl spray water	m^3/h	338	300	338		Calc	
	Trash discharge					Bin to suit IT-28 CAT	A	KEFI	
	Screen Spray Water		m^3/h			10	A	Lyco	
8.0 PRE-LEACH THICKENING									
Preleach thickening is not included. Cyclone overflow will be operated at ~46% w/w solids and feed via the trash screen to the CIL.							B	KEFI	
9.0 LEACH AND ADSORPTION				**Oxide**	**Fresh**	**Design**			
	Slurry pH					10.5	A	Lyco	
	pH Modification					Quicklime on mill feed conveyor	A	Lyco	
Leach Circuit									
	Number of tanks	Oxidation	No.	0	0	0	A	Lyco	
		Pre-leach	No.	0	0	0	A	Lyco	
		CIL	No.	6	6	6	A	Lyco	
		Total	No.	6	6	6		Calc	
	Tail Solution Gold Grade	Target	g Au/m^3			0.03	A	Lyco	
	Residence time for ultimate gold extraction		h	48	48		A	KEFI	
	Target residence time (CIL)		h	24	24		A	KEFI	
Tank Size	Minimum Tank Volume Required	Total	m^3	8,116	7,202	8,116		Calc	
		Per tank	m^3	1,353	1,200	1,353		Calc	
CIL Parameters									
	Carbon conc. in slurry	Range	g/L			5 - 15	A	Lyco	
	Carbon conc. in slurry	Nominal	g/L			10	A	Lyco	
Gold	Leached Solution Grade		g Au/m^3	2.11	2.39			Calc	
	Loaded carbon	Design	g Au/t	2,425	2,724			Calc	
	Barren carbon	Design	g Au/t			100	B	Lyco	
Silver	Leached Solution Grade		g Au/m^3	1.10	0.96			Calc	
	Loaded carbon	Design	g Au/t	1,091	962			Calc	
	Barren carbon	Design	g Au/t			100	B	Lyco	
Carbon	Carbon advance rate	Nominal	t/d	6.0	5.3			Calc	
		Selected	t/day			6.0	B	Lyco	
	Slurry transfer CIL tank 1		h/strip			6	B	Lyco	
			m^3/h			100		Calc	
	Slurry transfer CIL tank 1 : Method					Recessed impeller pump	A	Lyco	
	Slurry transfer CIL tanks 2 - 6		h/d			6	B	Lyco	
			m^3/h			100		Calc	
	Slurry transfer CIL tanks 2 - 6 : Method					Recessed impeller pump	B	Lyco	
	Carbon type					Pica G211-AS	A	Lyco	
	Size		mesh			6 x 12	B	Lyco	
	Carbon consumption rate	Nominal	kg/t CIL feed			0.030	A	Lyco	
	Carbon in Circuit	CIL	t Carbon	96	96			Calc	
	Consumption per day		kg/d	153	135			Calc	
CIL Aeration									
	Type					Blower Air	A	KEFI	1
	Oxygen uptake rate	CIL Tanks	mg O_2/L/min	0.018	0.008	0.018	A	KEFI	1
	Oxygen Percentage in Aeration Gas		%			21.0%	A	Industry	
	Gas Density (@ Normal Conditions)		kg/m^3			1.185	A	Industry	
	Sparging Requirement	Total	Nm^3/h	1,190	529	1,190		Calc	
		Total	kg/h			1,411		Calc	
	CIL Aeration demand per day	Total	t/d			34		Calc	
Intertank Screen									
	Type					Vertical, Mech. Swept	A	Lyco	
	Slurry Discharge					Top discharge into launders	A	Lyco	
	Cloth					SS Wedge Wire	A	Lyco	
	Aperture		mm			0.83	A	Lyco	
	Maximum screen flow	Oxide ore	m^3/h			438		Calc	
Loaded Carbon Recovery Screen									
	Type					Vibrating, Horizontal	A	Lyco	
	Deck					Polyurethane	A	Lyco	
	Aperture		mm			0.7 mm x 12 mm, co-current	A	Lyco	
	Flowrate	Slurry	m^3/h			100		Calc	
	Screen Spray Water		m^3/h			8	A	Lyco	
Carbon Safety Screen									
	Type					Vibrating, Horizontal	A	Lyco	
	Deck					Polyurethane	A	Lyco	
	Aperture		mm			1.0 mm x 12.0 mm , inline flow	A	Lyco	
	Flowrate	Slurry incl spray water	m^3/h	360	322	360		Calc	
	Carbon Discharge					Bin to suit IT-28 CAT	A	KEFI	
	Screen Spray Water		m^3/h			10	A	Lyco	

		Units				Rev	Source	Ref
Cyanide Addition								
Testwork Cyanide Consumption	Range	kg/t	0.11 - 0.58	0.08 - 0.22		A	KEFI	1
	Selected	kg/t	0.28	0.13		A	KEFI	1
Residual cyanide in CIL tails	Allowance	ppm NaCN	100	100		A	Assume	
Plant Cyanide addition	Plant feed	kg/t	0.40	0.25	0.40		Calc	
Lime Addition								
Testwork Lime Addition	Range	kg/t	0.29 - 6.5	0.32 - 0.59		A	KEFI	1
	Selected	kg/t	3.02	0.39		A	KEFI	1
Available CaO, Testwork	Testwork	% CaO			60	A	Test	
Type					CaO - Quicklime		Calc	
Available CaO, Plant Supply	Plant	% CaO			90		Calc	
Plant Lime Addition	Plant feed	kg/t	2.01	0.26	2.01		Calc	

10.0 ELUTION, ELECTROWINNING, CARBON REACTIVATION

	Rev	Source
Loaded carbon will be stripped by the Zadra method. The carbon will gravitate from the loaded carbon recovery screen to the acid wash column where acid washing will be performed. The carbon will then be transferred to the elution column for gold stripping. Gold in solution will be recovered by electrowinning. Recovered gold from the cathodes will be filtered, dried and smelted in a furnace to doré bars.	A	Lyco
The elution circuit / goldroom is required to operate on a 24 hour basis to enable the carbon loading to be maintained at levels that allow adsorption circuit efficiency to be maintained.	A	Lyco

Elution Circuit Design			Oxide	Fresh	Design			
Type					Pressure Zadra	A	Lyco	
Selected column size		t/strip			6.0	B	Lyco	
	Design	strip/week			7	A	Lyco	
Carbon batch volume (bed volume)		m^3			12.8		Calc	
Carbon - Gold	Loaded	gAu/t	2,425	2,724			Calc	
	Barren	gAu/t	100	100			Calc	
Carbon - Silver	Loaded	gAg/t	1,091	962			Calc	
	Barren	gAg/t	100	100			Calc	
Solution Flowrate		BV/h			3.0	B	Lyco	
		m^3/h			38.3		Calc	
Total Bed Volumes		No.			36	B	Lyco	
Acid Wash								
Acid Type					HCl	A	Lyco	
Wash Acid Strength		% w/v			3.0	B	Lyco	
Acid Soak Volume		BV			0.60	A	Lyco	
Time for acid soak		hours			0.5	A	Lyco	
Acid Rinse Volume		BV			4.0	A	Lyco	
Time for acid rinse		hours			1.3		Calc	
Acid Mix & Storage Tank Volume		BV			0.67	A	Lyco	
	Design Live	m^3			9.0	B	Lyco	
Strip Solution - Fresh Batch								
Cyanide Strength Required		% w/v			0.2	A	Lyco	
Caustic Strength Required		% w/v			2.0	A	Lyco	
Eluate Volume		BV			2.0	A	Lyco	
		m^3			25.5		Calc	
Top Up Volume		BV			0.60	A	Lyco	
Elution / Electrowinning								
Elution Temperature		°C			140	A	Lyco	
Elution/Electrowin Time		h			12		Calc	
Number of Electrowinning Cells		No.			2	A	Lyco	
Type of Cathode					Stainless Steel	A	Lyco	
Cathodes per Cell		No.			22	B	Lyco	
Cell Size		mm			1,000 x 1,000	B	Lyco	
Current Efficiency		%			10.0	A	Lyco	
Rectifier Size		A/cell			4,500	B	Lyco	
Eluate Heater Fuel Type					Diesel	A	Lyco	
Fuel Consumption		L/strip			452	B	Lyco	
Flow Rate per Cell		m^3/h			19.1		Calc	
Barren Solution Gold Grade		mg/L			<10	B	Lyco	
Sludge Recovery & Smelting		kg Au/day	14.0	13.9			Calc	
		kg Ag/day	6.0	4.6			Calc	
		kg Au+Ag/day	20.0	18.5			Calc	
Sludge Bulk Density	Range	t/m^3			4 - 6	A	Lyco	
	Design	t/m^3			4	A	Lyco	
Sludge Volume	Design Only	L/week	35	32			Calc	
Sludge removal Spray Pressure		kPag			25,000	B	Lyco	
Sludge Filter	Type				Vacuum Filter	B	Lyco	
	Number	No.			1	A	Lyco	
Sludge Drying					Drying Oven	B	Lyco	
Smelting Furnace								
Flux to Sludge Ratio					0.25 : 1	A	Lyco	
Furnace Feed		L/week	43.8	40.4			Calc	
Crucible		Designation			A200	B	Lyco	
Fuel Type					Diesel	A	Lyco	
	Operation	h/day			4	A	Lyco	
Carbon Dewatering Screen								
Type					Vibrating, Horizontal	A	Lyco	
Deck					Polyurethane	A	Lyco	
Aperture					0.7 mm x 12 mm, cross flow	A	Lyco	
Carbon Transfer		mins			30	A	Lyco	
Number of Bed Volumes	Design	No.			2	A	Lyco	
Raw Water Required per Batch		m^3			26		Calc	
Carbon Transfer % Solids		% w/w			19		Calc	

		Units	Oxide	Fresh	Design	Rev	Source	Ref
Carbon Reactivation								
Type					Horizontal Kiln	A	Lyco	
Location					Ground	A	Lyco	
Kiln Feed Hopper Capacity		BV			1.5	A	Lyco	
	Volume	m^3			19.1		Calc	
Kiln Capacity	Design	kg/h			300		Calc	
Kiln Operation		h/batch			20	A	Lyco	
Operating Temperature		°C			650 - 750	A	Lyco	
Retention Time at Operating Temp		mins			15	A	Lyco	
Fuel Type					Diesel	A	Lyco	
Fuel Consumption	Consumption	L/strip			630		Calc	
Carbon Quench								
Type					Raw Water	A	Lyco	
Water Flowrate Requirement	Average	m^3/h			3.0	B	Lyco	
		m^3/batch			60		Calc	
Carbon Sizing Screen								
Type					Vibrating, Horizontal	A	Lyco	
Deck					Polyurethane	A	Lyco	
Aperture		mm			1.1 mm x 12 mm, cross flow	A	Lyco	
Carbon feed rate	Nominal	t/h			0.30		Calc	
Carbon Transfer Water System								
Type					Kiln mounted on top of CIL tanks	B	Lyco	

11.0 CYANIDE DESTRUCTION CIRCUIT

Cyanide destruction will use the SO_2/Air method. SO_2 and oxygen in the presence of a soluble copper catalyst oxidises the cyanide to the less toxic compound cyanate (OCN^-). The SO_2 will be generated using sodium metabisulphite (SMBS). Copper catalyst will be added as copper sulphate solution. Oxygen will be supplied by sparging with air. Sodium hydroxide solution will be added to neutralise acid formed in the reaction to maintain a pH 8.5 to 9.0. — B — KEFI

		Units	Oxide	Fresh	Design	Rev	Source	Ref
Cyanide Destruction Process					SO_2 / Air	B	KEFI	
Reactor Feed Slurry Density		% solids w/w	43.0%	42.6%	43.0%		Calc	
Reactor Feed Throughput	Solids	t/h	213	188	213		Calc	
Reactor Feed Solution Analysis	CN_{WAD}	g/m^3			150	A	Lyco	
	Copper	g/m^3			5	A	Assume	
	Iron	g/m^3			4	A	Assume	
	Nickel	g/m^3			0	A	Assume	
	Zinc	g/m^3			0	A	Assume	
Target Reactor Discharge CN_{WAD}	CN_{WAD}	g/m^3			50	A	KEFI	
Design Reactor Discharge CN_{WAD}	CN_{WAD}	g/m^3			5	B	Lyco	
Required CN_{WAD} Reduction	CN_{WAD}	kg/h	40.9	36.6	40.9		Calc	
Reactor Residence Time Required		h			1.0	A	KEFI	
Air Holdup Allowance		%			15	A	Lyco	
Number of Reactors		No.			2	A	Lyco	
Selected Tank Volume	Live	m^3/tank			182	B	Lyco	
Actual Residence Time	Live	min	53	59	53		Calc	
The cyanide destruction tanks can be operated in series or parallel						B	Lyco	
Sulphur Dioxide/SMBS Required								
Source		$Na_2S_2O_5$ or SO_2			SMBS ($Na_2S_2O_5$)	A	Lyco	
SO_2/CN WAD Weight Ratio		kg/kg			5.6	B	KEFI	
$Na_2S_2O_5$/CN WAD Weight Ratio		kg/kg			8.3		Calc	
SMBS Consumption Rate	Solid	kg/h	337	302	337		Calc	
SMBS Solution Consumption Rate		m^3/h	1.69	1.51	1.69		Calc	
Copper Sulphate Required								
Chosen Copper Excess		Cu g/m^3			90	B	KEFI	
Copper Sulphate Required	Solid $CuSO_4.5H_2O$	kg/h	174	155	174		Calc	
Copper Sulphate Solution Consumption Rate		m^3/h	0.9	0.8	0.9		Calc	

pH Modification

Caustic addition for pH control in the cyanide destruction tank will be included in the design, but it is only expected to be required if the pH of the slurry in the cyanide destruction tanks deviates from the ideal range of 8.5 to 9.0. — B — Lyco

		Units	Oxide	Fresh	Design	Rev	Source	Ref
Reagent					NaOH Solution	B	Lyco	
Reagent Required	Solid NaOH	kg/h	142	127	142		Calc	
	Solution	m^3/h	0.7	0.6	0.7		Calc	
Air / Oxygen Required								
Oxygen Source					Blower Air	A	KEFI	
Oxygen Required		kg/h	82	73	82		Calc	
Air Required		kg/h	352	315	352		Calc	
Air Transfer Efficiency		%			15	A	Lyco	
Actual Blower Air Required		Nm^3/h	1,978	1,770	1,982		Calc	

12.0 TAILINGS STORAGE FACILITY

Slurry from the cyanide destruction facility will be pumped to the tailings storage facility. — A — Lyco

		Units	Oxide	Fresh	Design	Rev	Source	Ref
Tailings to TSF								
Feed rate	Solids	t/h	213	188	213		Calc	
	Solution	t/h	291	259	319		Calc	
Final Tailings % Solids		% w/w	42.2	42.0	40.0	A	Lyco	
	Slurry	m^3/h	291	259	397		Calc	
Tailings Storage Facility (TSF)								
Type					TBA	A	KEFI	
Feed Arrangement					TBA	A	KEFI	

				Units				Rev	Source	Ref
TSF Water Balance										
Water in Final Tailings			Average	m^3/h	288	262			Calc	
Water Retained in TSF Tails			Average	m^3/h	91	91			Calc	
	Consolidated Tails % Solids		Average	% w/w	70	70		B	Assume	
Decant Return			Average	m^3/h	158	131			Calc	
			Maximum	m^3/h				B	Assume	
	% Water in Tailings to Decant Return		Average	%	55	50		B	Assume	
			Maximum	m^3/h				B	Assume	
13.0 REAGENT STORAGE/MIXING					Oxide	Fresh	Design			
On Site Bulk Storage of Reagents			Number of Days	No.			14	B	KEFI	
Lime	*Consumption*									
	CIL		Nominal	kg/t ore	2.01	0.26			Calc	
			Nominal	kg/h	428	49	428		Calc	
			Design Allowance	Factor			150%	A	Lyco	
			Design	kg/h			642		Calc	
	Chemical form						CaO - Quicklime	A	Lyco	
	Available Lime			% CaO			90	A	KEFI	10
	Solid SG						3.30	A	Industry	
	Physical form supplied						Powder	A	Vendor	
	Delivery / packing						Bulka Bags	A	Lyco	
	Delivery size			t			1	A	Vendor	
	Storage method						Silo	A	Lyco	
	Storage capacity		Live	t			5		Calc	
			@Nominal	h	12	103			Calc	
	Bulk Reagent Storage									
	Storage Method						Reagent Shed	A	Lyco	
	Storage Capacity (based on Operating Usage Rate)			t	144	16			Calc	
NaCN	*Consumption*									
	CIL		Nominal	kg/t ore	0.40	0.25	0.40		Calc	
			Nominal	kg/h	85	47	85			
			Design Allowance	Factor			150%	A	Lyco	
			Design	kg/h			128		Calc	
	Elution			kg/strip			66		Calc	
	TOTAL		Design	t/d			3.1		Calc	
	Physical form supplied						Briquettes	A	Vendor	
	Delivery / packing			type			Bulka Box	A	Vendor	
	Delivery size			t			1	A	Vendor	
	Solution strength			w/v% NaCN			20	A	Lyco	
	Solution SG						1.10	A	Vendor	
	Solution Consumption		Design	m^3/h			0.7		Calc	
			Range	m^3/h			0 - 2	A	Lyco	
	Dosing						Ringmain	A	Lyco	
	Mixing Tank		Live capacity	m^3			15	B	Lyco	
			@ Design	h			23		Calc	
	Fresh water required		@ Design	m^3/day			13		Calc	
	Storage Tank		Live capacity	m^3			25	B	Lyco	
			@ Design	h			38		Calc	
	Bulk Reagent Storage									
	Storage Method						Reagent Shed	A	Lyco	
	Storage Capacity (based on Operating Usage Rate)			t	30	17			Calc	
NaOH	*Consumption*									
	Elution			kg/strip			664		Calc	
	CN Detox		Nominal	kg/d	3,409	3,052	3,409		Calc	
	TOTAL		Nominal	kg/d	4,073	3,716	4,073		Calc	
			Design Allowance	Factor			120%	A	Lyco	
			Design	kg/d			4,888		Calc	
	Physical form supplied						Pearl	A	Vendor	
	Delivery / packing			type			Bags	A	Vendor	
	Delivery size			kg			25	A	Vendor	
	Solution strength			w/v% NaOH			20	A	Lyco	
	Solution SG						1.08	A	Vendor	
	Total Solution NaOH		Design	m^3/d			24.4		Calc	
			Operating	m^3/d	20.4	18.6	20.4		Calc	
	Mixing		Storage capacity	m^3			15	A	Lyco	
				h			15		Calc	
	Fresh water required			m^3/day (avg)	18	19	18		Calc	
	Bulk Reagent Storage									
	Storage Method						Reagent Shed	A	Lyco	
	Storage Capacity (based on Operating Usage Rate)			t	52	52			Calc	

			Units				Rev	Source	Ref
HCL	*Consumption*								
	Elution	Conc Acid	kg/strip			718		Calc	
		Conc Acid	m^3 /week			4.3		Calc	
		Diluted Acid	L/strip			6,607		Calc	
	Physical form supplied					Conc acid solution	A	Vendor	
	Delivery / packing					Isotainers	A	Vendor	
	Delivery Size		L			1,000	A	Vendor	
	Supply acid strength	Conc Acid	%w/w			32	A	Vendor	
	Supply acid SG					1.16	A	Vendor	
	Solution mix strength	Diluted Acid	%w/w			3		Calc	
	Mix tank	Live	m^3			9		Calc	
	Fresh water required		m^3/day (avg)			5.7		Calc	
	Bulk Reagent Storage								
	Storage Method					Reagent Shed	A	Lyco	
	Storage Capacity (based on Operating Usage Rate)		m^3			9		Calc	
Copper Sulphate	*Consumption*								
	Cyanide Destruction Circuit	Nominal	kg/t	0.82	0.83	0.82		Calc	
			kg/h	174	155	174		Calc	
		Design Allowance	Factor			100%	B	Lyco	
		Design	kg/h			174		Calc	
			t/day			4.2		Calc	
	Physical form supplied					Solid, Crystals	A	KEFI	
	Delivery / packing					Bags	A	KEFI	
	Delivery Size		kg			25	A	KEFI	
	Solution Concentration		% w/v			20	A	Lyco	
	Solution SG		t/m^3			1.11	A	Industry	
	Solution Consumption	Nominal	m^3/h	0.87	0.77	0.87		Calc	
		Design	m^3/h			0.87		Calc	
	Mixing		bags/mix			40	A	Lyco	
	Mixing Tank	Live capacity	m^3			5	A	Lyco	
		@ Design	h			6		Calc	
	Fresh water required	@ Design	m^3/day			17		Calc	
	Storage Tank	Live capacity	m^3			5.0	A	Lyco	
		@ Design	h			6		Calc	
	Bulk Reagent Storage								
	Storage Method					Reagent Shed	B	Lyco	
	Storage Capacity (based on Operating Usage Rate)		t	58	52			Calc	
Sodium Metabisulphite	*Consumption*								
	Cyanide Destruction Circuit		kg/t	1.59	1.61	1.59		Calc	
			kg/h	337	302	337		Calc	
		Design Allowance	Factor			100%	B	Lyco	
		Design	kg/h			337		Calc	
			t/day			8.1		Calc	
	Physical form supplied					Solid, Flake	A	KEFI	
	Delivery / packing					Bulk Bags	A	KEFI	
	Delivery Size		t			1.0	A	KEFI	
	Solution Concentration		% w/v			20	A	Lyco	
	Solution SG		t/m^3			1.06	A	Lyco	
	Solution Consumption	Nominal	m^3/h	1.7	1.5			Calc	
		Design	m^3/h			1.7		Calc	
	Mixing		bags/mix			3	A	Lyco	
	Mixing Tank	Live capacity	m^3			15	A	Lyco	
		@ Design	h			9		Calc	
	Fresh water required	@ Design	m^3/day			35		Calc	
	Storage Tank	Live capacity	m^3			25	A	Lyco	
		@ Design	h			15		Calc	
	Bulk Reagent Storage								
	Storage Method					Reagent Shed	B	Lyco	
	Storage Capacity (based on Operating Usage Rate)		t	113	101			Calc	
Activated Carbon	*Consumption*								
	CIL	Allowance	g/t ore			30		Calc	
		Nominal	kg/day	153	135	153		Calc	
	Type					Pica G211-AS		Calc	
	Physical form supplied					Solid	A	Industry	
	Delivery / packing					Bags	A	Industry	
	Delivery size		kg			500	A	Industry	
	Carbon Bulk Density					0.47	A	Industry	
	Bulk Reagent Storage								
	Storage Method					Reagent Shed	A	Industry	
	Storage Capacity	@ Nominal Usage	t	2.1	1.9			Calc	

			Units				Rev	Source	Ref
Grinding Media	*Consumption*		kg/t	0.94	0.94			Calc	
			t/day	4.8	4.2			Calc	
	Physical form supplied					Steel Balls	A	Vendor	
	Delivery / packing		type			Drums	A	Vendor	
	Delivery size		kg			900	A	Vendor	
	Bulk Reagent Storage								
	Storage Method					Reagent Shed	A	Lyco	
	Storage Capacity (based on Operating Usage Rate)		t	67	59		A	Assume	
Diesel									
	Storage Type					Plant Diesel Day Tank	A	Lyco	
	Storage Capacity	Live	m^3			5	B	Lyco	
	Plant Diesel Delivery					Constant head tank	A	Lyco	
	Consumption								
	Elution Heater		L/strip			452		Calc	
	Smelting Furnace		L/pour			100		Calc	
	Carbon Regeneration Kiln		L/strip			630		Calc	
	Total		kL/week			7.7			
14.0 WATER SYSTEM				Oxide	Fresh	Design			
Process Water	Source					Raw Water / Decant Return	A	Lyco	
	Process Water Consumption	Average	m^3/h	264	235	264		Calc	
		Maximum	m^3/h	370	341	370		Calc	
		Average	m^3/day			6,329			
	Storage	Type				Tank	B	Lyco	
	Capacity	Live	m^3			500	B	Lyco	
		@ Nominal Flow	h	1.9	2.1			Calc	
Raw Water	**Main Raw Water Storage (off site)**								
	Source					Raw water diversion dam (by others)	B	KEFI	
	Capacity		m^3			TBA	B	KEFI	
	Plant Raw Water Storage								
	Raw Water Consumption (Excluding makeup)	Average	m^3/h	34.8	33.1	34.8		Calc	
		Maximum	m^3/h	103	112	112.2		Calc	
		Average	m^3/day			835		Calc	
	Raw Water Consumption (Including makeup)	Average	m^3/h	173	161	173		Calc	
		No Decant Return	m^3/h	334	308	334		Calc	
		Average	m^3/day			4,164		Calc	
	Capacity	Average	h	4.1	4.4			Calc	
		No Decant Return	h	2.1	2.3			Calc	
	Storage	Type				Tank	A	KEFI	
	Capacity	Total Live	m^3			1,000	B	Lyco	
Potable Water	Potable Water Source					Raw Water	A	KEFI	
	Main Storage / Potable Water Plant	Location				Plant / Camp	B	KEFI	
	Potable Water Storage								
	Camp								
	Potable Water Tank	Live	m^3			50	A	KEFI	
		@ Avg Usage	days			0.7		Calc	
	Plant								
	Source					Separate Plant Potable Water Plant	B	KEFI	
	Potable Water Tank	Nominal	m^3			50	B	Lyco	
		@ Avg Usage	days			1.4		Calc	
	Potable Water Consumption								
	Camp								
	Number of personnel		No.			500	A	KEFI	
	Domestic use	Per Head	L/d			150	A	KEFI	
	Plant								
	Number of personnel		No.			240	A	KEFI	
	Domestic use	Per Head	L/d			70	A	Lyco	
	Other								
	Allowance	(Plant Area)	m^3/d			20	B	Assume	
	Total Potable Water Consumed		m^3/d			112		Calc	
	Potable Water Treatment Plant - Process Plant Only								
	Treatment method					Filtration, Chlorination, UV sterilisation	A	KEFI	
	Deisgn Operating Hours		h/day			12	A	Lyco	
	Design Feed rate		m^3/h			3		Calc	
	Feed Rate	@ Avg Usage	m^3/h			1.5		Calc	
15.0 WATER SUPPLY				Oxide	Fresh	Design			
Raw Water Pumps (Raw Water Diversion Dam)									
	Number of Pumps					1 duty (+uninstalled spare)	B	Lyco	
	Pumping Destination					Plant Raw water tank	A	Lyco	
	Plant River Water Requirement	Average	m^3/h	173	161	173		Calc	
		No Decant Return	m^3/h	334	308	334		Calc	
	Required Pumping Flowrate	Minimum	m^3/h			334		Calc	

			Units				Rev	Source	Ref
Decant Return Pumps						1 duty (+ uninstalled spare)	A	KEFI	
Pumping Destination						Process Water Pond	A	KEFI	
Water Recovered from Tailings		100% Return	m^3/h	291	259	291		Calc	
		Average	m^3/h	158	131	158		Calc	
Water Required for Raw Water Duties during Dry Season		Average	m^3/h	173	161	173		Calc	
Total Decant Return during Wet Season		Average	m^3/h	158	131	158		Calc	
Total Decant Return during Dry Season		Average	m^3/h	332	292	332		Calc	

16.0 AIR

			Units		Rev	Source
Plant Air	Compressor Type			Rotary screw with air dryers	A	Lyco
	Number of Units			2	A	Lyco
	Delivery Volume	Each	Nm^3/hr	500	A	Lyco
	Delivery Pressure		kPag	750	A	Lyco
CIL/CN Destruct Air	Blower Type				A	Lyco
	Number of Units			3	A	Lyco
	Configuration			2 x Duty + 1 x Standby	A	Lyco
	Air Addition for Leaching Circuit Tanks		Nm^3/hr	1,190		Calc
	Air Addition for Cyanide Destruction		Nm^3/hr	1,982		Calc
	Total Air		Nm^3/hr	3,173		Calc
	Delivery Pressure		kPag	TBC	A	Lyco

17.0 REFERENCES

1 KEFI Minerals SECTION 6 Metallurgical Testwork and Process Plant Design July 2015
2 ALS AMMTEC Report A14136 - Fresh Ore June 2012
3 OMC - Comminution Circuit Evaluation with 1.2 Mtpa mine schedule Ore Blends
4 Outotec Thickening Testwork Report S200TB Tulu Kapi Gold Part B 16-4-12
5 ALS AMMTEC Report No A14207
6 SP581 Tulu Kapi Reagent Consumption and Cost Response to KEFI 16-10-15
7 OMC Mill Size Selection Report No 26031 8-10-15
8 Lycopodium Proposal KEFI Minerals Ethiopia Tulu Kapi Gold Project Plant and Infrastructure EPC 29 April 2016
9 TK Mine Schedule - 10 May 2016
10 Email from D. Paget 22/6/16
11 OMC Tulu Kapi Mill Size Report 7743 Rev A July 2016
12 KEFI Minerals -PROCESS_schedule-July_2016.xls, 4 July 2016
13 TQ 1 Response - 21/7/2016
14 TQ 2 Response - 21/7/2016
15 OMC - Tulu Kapi Mill Size, Report No. 7743 Rev 0, July 2016

Project	Tulu Kapi Gold Project
Client	KEFI Minerals Ethiopia PLC
Date	23-Aug-16
Revision	B

Legend
Bore Water
Raw Water
Process Water
Reagents

Mass Balance - OXIDE ORE

Crushing

Stream Name		ROM Ore	Primary Crusher Discharge	Crushing Dust Suppress.[1]	Service Points[1]
Solids	t/h	243	243		
% Solids	%w/w	95.0%	95.0%		
Solids SG		2.70	2.70		
Solution	t/h	13	13	5	0
Solution SG		1.00	1.00	1.00	1.00
Total Stream	t/h	255	255	5	0
Volumetric Flow	m^3/h			5	0
Slurry SG				1.00	0.00

1) Dust suppression & service points water addition and evaporation asumed to result in no net moisture gain.

Surge Bin and Reclaim

Stream Name		Crushed Ore	Surge / Dead Stockpile Dust	Crushed Ore to Surge Bin	Total New Ore to Mill Feed Conveyor	Quicklime Addition to Mill Feed	Feed to Mill from Feed Conveyor
Solids	t/h	243		213	213	0.64	213
% Solids	%w/w	95.0%		95.0%	95.0%	100%	95.0%
Solids SG		2.70		2.70	2.70	3.30	2.70
Solution	t/h	13	10	11	11	0.00	11
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	255	10	224	224	0.64	224
Volumetric Flow	m^3/h		10				
Slurry SG			1.00				

1) Dust suppression water addition and evaporation asumed to result in no net moisture gain.

Milling

Stream Name		New Milling Circuit Feed	Cyclone U/Flow	Total Mill Feed	Mill Dilution Water	Mill Discharge	Mill Trommel Sprays	Mill Trommel Oversize	Mill Trommel Undersize	Mill Hopper Dilution	Cyclone Feed Pump Gland	Cyclone Feed	Cyclone Overflow	Cyclone Underflow
Solids	t/h	213	531	744		744		0	744			744	213	531
% Solids	%w/w	95.0%	74.0%	79.0%		75.0%			73.5%			63.0%	46.0%	74.0%
Solids SG		2.70	2.70	2.70		2.70			2.70			2.70	2.70	2.70
Solution	t/h	11.2	187	198	50	248	20	0	268	166	2	436	249	187
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	224	718	942	50	992	20		1,012	166	2	1,180	462	718
Volumetric Flow	m^3/h		383	473	50	523	20		543	166	2.0	712	328	383
Slurry SG			1.87	1.99	1.00	1.89	1.00		1.86	1.00	1.00	1.66	1.41	1.87
													Recirc Load	250%

Trash Screening

Stream Name		Cyclone Overflow	Trash Screen Feed	Trash Screen Spray Water	Trash Screen Oversize	Total Trash Screen Underflow
Solids	t/h	213	213		0.0	213
% Solids	%w/w	46.0%	46.0%		85.0%	45.0%
Solids SG		2.70	2.70		2.70	2.70
Solution	t/h	249	249	10	0.0	259
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	462	462	10	0.0	472
Volumetric Flow	m^3/h	328	328	10	0.0	338
Slurry SG		1.41	1.41	1.00	0.0	1.40

CIL

Stream Name		Trash Screen Underflow to CIL	Cyanide Addition	Loaded Carbon Spray Water	Dilution Streams - Elution & Regen	Plant Washdown Water	Regenerated Carbon Quench Water	Carbon Sizing Screen Sprays	Carbon Safety Screen Feed	Carbon Safety Screen Sprays	Carbon Safety Screen Undersize	Total CIL Tails (Avg)
Solids	t/h	213							213		213	213
% Solids	%w/w	45.0%							43.9%		43.0%	43.0%
Solids SG		2.70							2.70		2.70	2.70
Solution	t/h	259	0.43	2	2.4	0	2.5	5	272	10	282	282
Solution SG		1.00	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	472.0	0.43	2	2	0	3	5	484	10	494	494
Volumetric Flow	m^3/h	338.2	0.39	2	2	0	3	5	350	10	360	360
Slurry SG		1.40	1.10	1.00	1.00	0.00	1.00	1.00	1.38	1.00	1.37	1.37

Cyanide Destruction & Tails Pumping

Stream Name		Total Cyanide Destruct Tank Feed	SMBS Addition	CuSO4 Addition	NaOH Addition	Cyanide Destruct Discharge	Misc. Streams to Tails Hopper	Dilution Streams - Acid Wash Tails	Tails Hopper Feed	Tails D/C Pump 1 Gland Water	Tails Line 1 D/C at Tails Dam	Tails D/C Pump 2 Gland Water	Tails Line 2 D/C at Tails Dam	Total Tailings to TSF
Solids	t/h	213				213			213		106		106	213
% Solids	%w/w	43.0%				42.7%			42.5%		42.2%		42.2%	42.2%
Solids SG		2.70				2.70			2.70		2.70		2.70	2.70
Solution	t/h	282	1.79	0.97	0.77	285	0	2.5	288	1.5	145	1.5	145	291
Solution SG		1.00	1.06	1.11	1.08	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	494	1.79	0.97	0.77	498	0	2.5	500	1.5	252	1.5	252	503
Volumetric Flow	m^3/h	360	1.69	0.87	0.71	364	0.0	2.5	366	1.5	185	1.5	185	369
Slurry SG		1.37	1.06	1.11	1.08	1.37	0.00	1.00	1.37	1.00	1.36	1.00	1.36	1.36

Water

Stream Name		Total Process Water Not into Slurry	Process Water Streams	Reagents - Water into Slurry	Process Water Spray Streams	Process Water Dilution Streams	CIL - Raw Water into Slurry
Solids	t/h						
% Solids	%w/w						
Solids SG							
Solution	t/h	15	259	3.5	42	216	12.4
Solution SG		1.00	1.0	1.00	1.0	1.0	1.00
Total Stream	t/h	15	259	3.5	42	216	12
Volumetric Flow	m^3/h	15	259	3.5	42	216	12
Slurry SG		1.00	1.00	1.00	1.00	1.00	1.00

Lycopodium

Project	Tulu Kapi Gold Project		Bore Water
Client	KEFI Minerals Ethiopia PLC		Filtered Water
Date	23-Aug-16		Process Water
Revision	B		Reagents

Mass Balance - PRIMARY ORE (DESIGN BLEND)

Crushing

Stream Name		ROM Ore	Primary Crusher Discharge	Crushing & Screening Dust Suppress.[1]	Service Points[1]
Solids	t/h	214	214		
% Solids	%w/w	95.0%	95.0%		
Solids SG		2.68	2.68		
Solution	t/h	11	11	5	0
Solution SG		1.00	1.00	1.00	1.00
Total Stream	t/h	225	225	5	0
Volumetric Flow	m^3/h			5	0
Slurry SG				1.00	0.00

1) Dust suppression & service points water addition and evaporation asumed to result in no net moisture gain.

Ore Storage and Reclaim

Stream Name		Crushed Ore	Dead Stockpile Dust Suppress.[1]	Crushed Ore Reclaim	Total Ore to Mill Feed Conveyor	Quicklime Addition to Mill Feed	Feed to Mill from Feed Conveyor
Solids	t/h	214		188	188	0.07	188
% Solids	%w/w	95.0%		95.0%	95.0%	100%	95.0%
Solids SG		2.68		2.68	2.68	3.30	2.68
Solution	t/h	11	10	10	10	0.00	10
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	225	10	197	197	0.07	197
Volumetric Flow	m^3/h		10				
Slurry SG			1.00				

1) Dust suppression water addition and evaporation assumed to result in no net moisture gain.

Milling

Stream Name		New Milling Circuit Feed	Cyclone U/Flow	Total Mill Feed	Mill Dilution Water	Mill Discharge	Mill Trommel Sprays	Mill Trommel Oversize	Mill Trommel Undersize	Mill Hopper Dilution	Cyclone Feed Pump Gland Water	Cyclone Feed	Cyclone Overflow	Cyclone Underflow
Solids	t/h	188	750	938		938		0	938			938	188	750
% Solids	%w/w	95.0%	74.0%	77.4%		75.0%			73.8%			66.0%	46.0%	74.0%
Solids SG		2.68	2.68	2.68		2.68			2.68			2.68	2.68	2.68
Solution	t/h	9.9	264	273	39	313	20	0	333	149	2.0	484	220	264
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	197	1,014	1,211	39	1,250	20		1,270	149	2	1,421	408	1,014
Volumetric Flow	m^3/h		543	623	39	662	20		682	149	2.0	833	290	543
Slurry SG			1.87	1.94	1.00	1.89	1.00		1.86	1.00	1.00	1.71	1.41	1.87

Recirc Load 400%

Trash Screening

Stream Name		Cyclone Overflow	Trash Screen Feed	Trash Screen Spray Water	Trash Screen Oversize	Total Trash Screen Underflow
Solids	t/h	188	188		0.0	188
% Solids	%w/w	46.0%	46.0%		85.0%	44.9%
Solids SG		2.68	2.68		2.68	2.68
Solution	t/h	220	220	10	0.0	230
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	408	408	10	0.0	418
Volumetric Flow	m^3/h	290	290	10	0.0	300
Slurry SG		1.41	1.41	1.00	0.0	1.39

CIL

Stream Name		Trash Screen Underflow to CIL	Cyanide Addition	Loaded Carbon Spray Water	Dilution Streams - Elution & Regen	Plant Washdown Water	Regenerated Carbon Quench Water	Carbon Sizing Screen Sprays	Carbon Safety Screen Feed	Carbon Safety Screen Sprays	Carbon Safety Screen Undersize	Total CIL Tails (Avg)
Solids	t/h	188							188		188	188
% Solids	%w/w	44.9%							43.6%		42.6%	42.6%
Solids SG		2.68							2.68		2.68	2.68
Solution	t/h	230	0.24	2	2.4	0	2.5	5	242	10	252	252
Solution SG		1.00	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	417.6	0.24	2	2	0	3	5	430	10	440	440
Volumetric Flow	m^3/h	300.1	0.22	2	2	0	3	5	312	10	322	322
Slurry SG		1.39	1.10	1.00	1.00	0.00	1.00	1.00	1.38	1.00	1.36	1.36

Cyanide Destruction & Tails Pumping

Stream Name		Total Cyanide Destruct Tank Feed	SMBS Addition	CuSO4 Addition	NaOH Addition	Cyanide Destruct Discharge	Misc. Streams to Tails Hopper	Dilution Streams - Acid Wash Tails	Tails Hopper Feed	Tails D/C Pump Gland Water	Tailings to TSF
Solids	t/h	188				188			188		188
% Solids	%w/w	42.6%				42.3%			42.1%		42.0%
Solids SG		2.68				2.68			2.68		2.68
Solution	t/h	252	1.60	0.86	0.69	255	0	2.5	258	1.5	259
Solution SG		1.00	1.06	1.11	1.08	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	440	1.60	0.86	0.69	443	0	2.5	445	1.5	447
Volumetric Flow	m^3/h	322	1.51	0.77	0.64	325	0.0	2.5	328	1.5	329
Slurry SG		1.36	1.06	1.11	1.08	1.36	0.00	1.00	1.36	1.00	1.36

Water

Stream Name		Total Process Water Not into Slurry	Process Water Streams	Reagents - Water into Slurry	Process Water Spray Streams	Process Water Dilution Streams	CIL - Raw Water into Slurry
Solids	t/h						
% Solids	%w/w						
Solids SG							
Solution	t/h	15	230	3.1	42	188	10.9
Solution SG		1.00	1.0	1.00	1.0	1.0	1.00
Total Stream	t/h	15	230	3.1	42	188	11
Volumetric Flow	m^3/h	15	230	3.1	42	188	11
Slurry SG		1.00	1.00	1.00	1.00	1.00	1.00

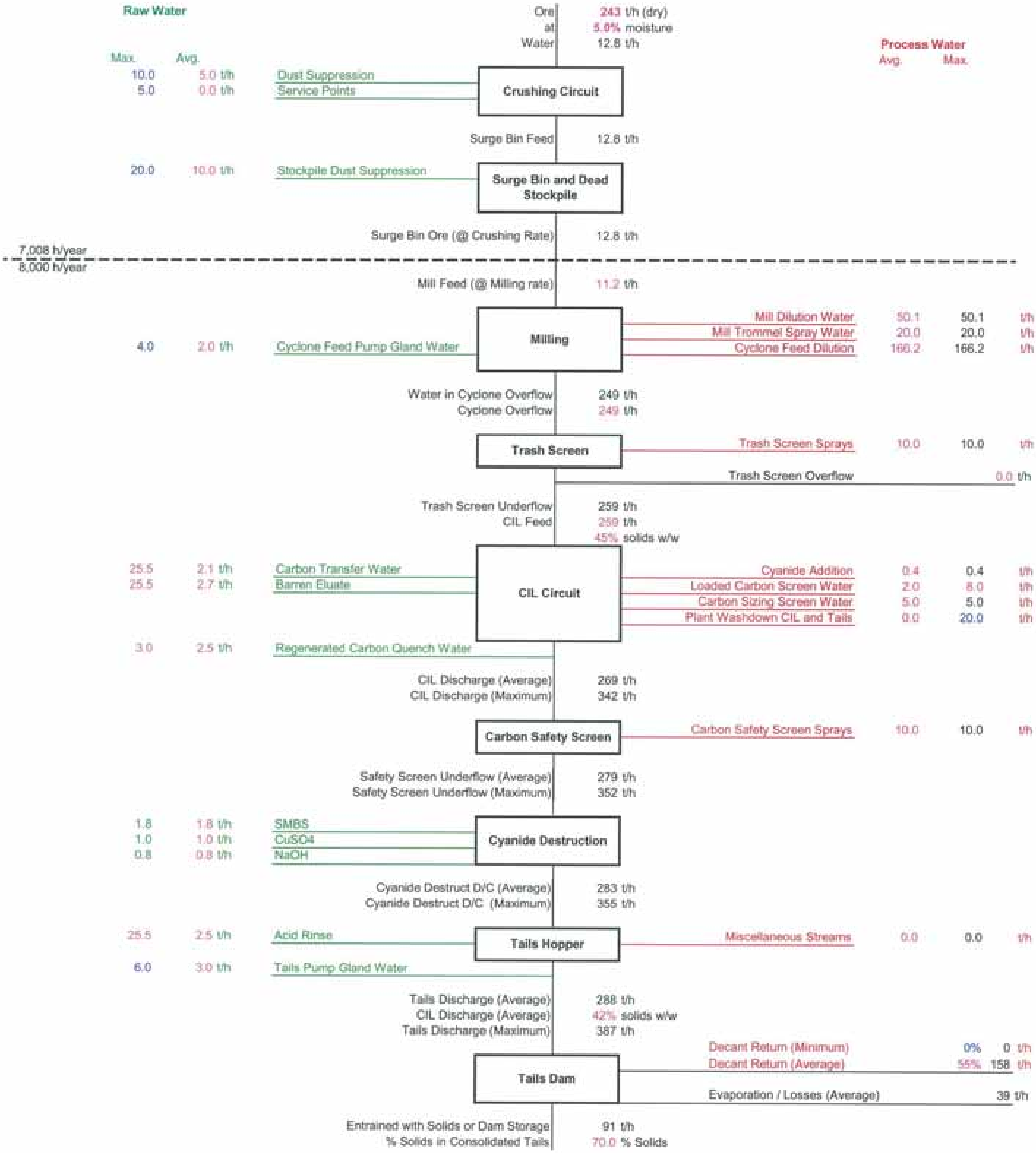
Lycopodium

Project: Tulu Kapi Gold Project
Client: KEFI Minerals Ethiopia PLC
Date: 23-Aug-16
Revision: B

SIMPLIFIED OVERALL WATER BALANCE - OXIDE ORE

Flowrates	Avg.	Max./Inst.	
Process Water Pumps	264	290	t/h Total into Slurry
Raw Water	33.3	103	t/h Total
Raw Water	18.3	68	t/h Total into Slurry
Potable Water	1.5	3.1	t/h Total

Plant Water Balance Summary	Average Flows (t/h)	
Water in Mill Feed	11	11
Water in Plant Tailings	288	288
Difference - Water required into slurry	277	277
@ Average Decant Return	158	
@ No Decant Return		0
Raw Water into slurry	2	2
Water Streams into slurry	162	2
Difference - Raw Water Makeup	115	275
Raw Water Into Plant Required	117	277
Dust Suppression & Crushing Service Points	15	15
Other Plant Raw Water Required	15	15
Total Plant Raw Water Required	**147**	**307**
Potable Water	2	2
Mine Services & Mine Dust Suppression	20	20
Other	5	5
Total Raw Water Required	**173**	**334**



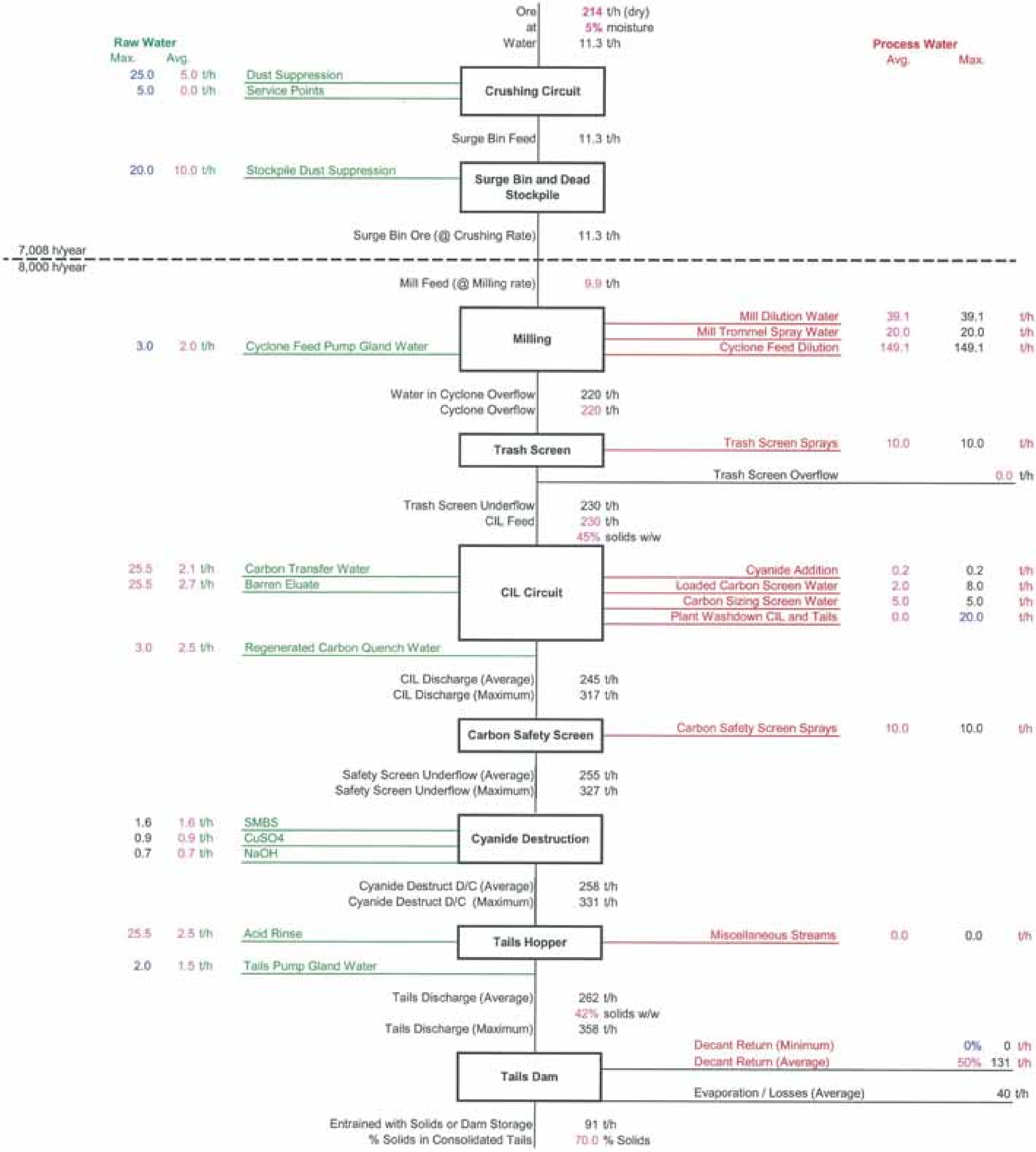
Lycopodium

Project Tulu Kapi Gold Project
Client KEFI Minerals Ethiopia PLC
Date 23-Aug-16
Revision B

SIMPLIFIED OVERALL WATER BALANCE - PRIMARY ORE

Flowrates	Avg.	Max./Inst.	
Process Water Pumps	235	261	t/h Total into Slurry
Raw Water	31.4	112	t/h Total
Raw Water	16.4	62	t/h Total into Slurry
Potable Water	1.5	3.1	t/h Total

Plant Water Balance Summary	Average Flows (t/h)	
Water in Mill Feed	10	10
Water in Plant Tailings	262	262
Difference - Water required into slurry	252	252
@ Average Decant Return	131	
@ No Decant Return		0
Raw Water into slurry	16	16
Water Streams into slurry	164	16
Difference - Raw Water Makeup	88	235
Raw Water Into Plant Required	105	252
Dust Suppression & Crushing Service Points	15	15
Other Plant Raw Water Required	15	15
Total Plant Raw Water Required	**135**	**282**
Potable Water	2	2
Mine Services & Mine Dust Suppression	20	20
Other	5	5
Total Raw Water Required	**161**	**308**



APPENDIX 6.2

EQUIPMENT LIST

KEFI MINERALS

KEFI MINERALS ETHIOPIA PLC

TULU KAPI GOLD PROJECT

MECHANICAL EQUIPMENT AND BUILDING LISTS

1953-000-MELST-0001

September 2016

Prepared by:

Lycopodium

REV NO.	DATE	DESCRIPTION OF REVISION	BY	DESIGN APPROVED	PROJECT APPROVED	CLIENT APPROVED
1	28-9-16	RE-ISSUED FOR FEED				
0	07.09.16	ISSUED FOR FEED	BS	BR	BR	

Lycopodium Minerals Pty Ltd ABN: 34 055 880 209 Level 5, 1 Adelaide Terrace, East Perth Western Australia 6004

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
AREA 120 / FACILITY 121 - PRIMARY CRUSHING										
120	121-SC-001	1	0	STATIC GRIZZLY			700 X 700 mm aperture, MS bisalloy lined			
120	121-BN-001	1	0	ROM BIN	Mild Steel (12 mm bisalloy lined)	192 tonnes live capacity 120 m3 live capacity	MS bisalloy lined			
120	121-ZM-001	1	0	ROM BIN HUNGRY BOARDS	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
120	121-ZM-006	1	0	ROM BIN SPRAY MANIFOLD						
120	121-CH-001	1	0	PRIMARY FEEDER FEED CHUTE	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
120	121-FE-001	1	0	PRIMARY APRON FEEDER	Manufacturers Standard	255 tph wet	1200 mm wide x 9 m long x 2.3 m lift apron type feeder c/w electromechanical drive	Variable	30.0	30.0
120	121-ZM-002	1	0	PRIMARY FEEDER LUBRICATION SYSTEM	Manufacturers Standard		c/w grease pump. Part of primary apron feeder	Feeder		
120	121-CH-002	1	0	PRIMARY FEEDER DRIBBLE CHUTE			MS bisalloy lined			
120	121-CH-003	1	0	VIBRATING GRIZZLY FEED CHUTE	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
120	121-SC-002	1	0	VIBRATING GRIZZLY	Manufacturers Standard	243 tph dry	1.4 m wide x 4.8 m long stepped grizzly screen with 150 mm spacing's	Fixed	22.0	22.0
120	121-CH-004	1	0	VIBRATING GRIZZLY U/S CHUTE	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
120	121-CH-005	1	0	PRIMARY CRUSHER FEED CHUTE	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
120	121-CR-001	1	0	PRIMARY CRUSHER	Manufacturers Standard	243 tph dry	1200 x 870 mm feed opening c/w hydraulic power unit, centralised automatic lubrication system, 132	Fixed	160.0	160.0
120	121-ZM-007	1	0	VIBRATING GRIZZLY DRIVE SUPPORT FRAME						
120	121-ZM-003	1	0	PRIMARY CRUSHER HYDRAULIC POWER UNIT	Manufacturers Standard		Hydraulic power pack c/w pumps, fans	Fixed	2.2+1.5	3.7
120	121-ZM-004	1	0	PRIMARY CRUSHER LIQUID RESISTANCE STARTER (LRS)	Manufacturers Standard		LRS			
120	121-ZM-005	1	0	PRIMARY CRUSHER AUTOMATIC LUBRICATION UNIT	Manufacturers Standard		Automatic lubrication device for eccentric shaft bearings c/w the grease dispensing unit, distributor and all necessary hoses. 230 V	Feeder	0.6	0.6
120	121-CH-006	1	0	PRIMARY CRUSHER DISCHARGE CHUTE	Mild Steel (12 mm bisalloy lined)		Part of Fire Protection Pump skid. Direct coupled diesel driven, c/w diesel engine.			
120	121-CN-001	1	0	PRIMARY CRUSHER MAINTENANCE HOIST	Manufacturers Standard		5 t capacity, dual speed electric wire rope hoist and travel c/w 6/0.25 kW drive.	Feeder	30.0	30.0
120	121-CV-001	1	0	CV-001 PRIMARY CRUSHER DISCHARGE CONVEYOR		255 tph wet	c/w drive, guards, belt, pulleys, skirts, idlers, scrapers, plough and take-up	Fixed	30.0	30.0
120	121-WE-001	1	0	CV001 WEIGHTOMETER	Manufacturers Standard	0-600tph	c/w weigh frame, load cell local and remote indication and calibration weights			
120	121-CH-007	1	0	CV001 HEAD CHUTE	Mild Steel (12 mm bisalloy lined)		MS bisalloy lined			
AREA 120 / FACILITY 125 - ORE STORAGE										
120	125-CV-002	1	0	CV-002 STOCKPILE FEED CONVEYOR		255 tph wet	c/w drive, guards, belt, pulleys, skirts, idlers, scrapers, plough and take-up	Fixed	30.0	30.0
120	125-CH-001	1	0	CV002 HEAD CHUTE	Mild Steel (12 mm bisalloy lined)					
120	125-ZM-001	1	0	CV002 SPRAY MANIFOLD						
120	125-CH-002	1	0	SURGE BIN OVERFLOW CHUTE	Mild Steel (12 mm bisalloy lined)					
AREA 130 / FACILITY 131 - RECLAIM										
130	131-BN-001	1	0	SURGE BIN	Mild Steel (12 mm bisalloy lined)					
130	131-FE-001	1	0	RECLAIM APRON FEEDER	Manufacturers Standard	224 tph wet	c/w electro-mechanical drive, Cat SALT D4 chain	Variable	18.5	18.5
130	131-ZM-001	1	0	RECLAIM FEEDER LUBRICATION SYSTEM	Manufacturers Standard			Feeder		
130	131-CH-001	1	0	RECLAIM FEEDER DRIBBLE CHUTE	Mild Steel (12 mm bisalloy lined)					
130	131-CH-002	1	0	RECLAIM FEEDER HEAD CHUTE	Mild Steel (12 mm bisalloy lined)					
130	131-CV-003	1	0	CV-003 MILL FEED CONVEYOR		224 tph wet	c/w drive, guards, belt, pulleys, skirts, idlers, scrapers, plough and take-up	Fixed	30.0	30.0
130	131-WE-001	1	0	MILL FEED WEIGHTOMETER	Manufacturers Standard	0-600tph	c/w tachometer assembly, weigh frame, 2 idlers on weigh frame, 2 idlers as lead in, 2 idlers as lead out, calibration masses, and electrical enclosure			
130	131-CH-003	1	0	MILL FEED CONVEYOR HEAD CHUTE	Mild Steel (12 mm bisalloy lined)					
AREA 130 / FACILITY 132 - GRINDING										
130	132-CH-001	1	0	SAG MILL FEED SPOUT CHUTE	Mild Steel (20 mm bisalloy lined)		part of SAG Mill package			
130	132-ZM-001	1	0	SAG MILL FEED SPOUT	Manufacturers Standard		part of SAG Mill package			
130	132-BX-001	1	0	SAG MILL CYCLONE UNDERFLOW RETURN BOX	Mild Steel (6 mm nat. rubber lined)		-			
130	132-ML-001	1	0	SAG MILL	Manufacturers Standard	224 tph wet	Incl ancillaries and inching drive for maintenance, VVVF drive.			
130	132-ZM-002	1	0	SAG MILL MOTOR	Manufacturers Standard		part of SAG Mill package		4,500.0	4,500.0
130	132-ZM-014	1	0	SAG MILL MOTOR SPACE HEATER	Manufacturers Standard		part of SAG Mill package	Feeder	0.8	0.8
130	132-ZM-003	1	0	SAG MILL MOTOR BEARING LUBRICATION SYSTEM	Manufacturers Standard		part of SAG Mill package			
130	132-PP-001	1	0	SAG MILL MOTOR BEARING LUBRICATION PUMP 1	Manufacturers Standard		part of SAG Mill package	Fixed	2.2	2.2
130	132-PP-002	1	1	SAG MILL MOTOR BEARING LUBRICATION PUMP 2	Manufacturers Standard		part of SAG Mill package	Fixed	2.2	
130	132-ZM-004	4	0	SAG MILL MAIN BEARING HOUSING LUBRICATION OIL HEATER	Manufacturers Standard		part of SAG Mill package	Feeder	1.5	6.0
130	132-ZM-005	1	0	SAG MILL INCHING DRIVE	Manufacturers Standard		part of SAG Mill package	Fixed	90.0	90.0
130	132-ZM-015	1	0	SAG MILL INCHING DRIVE BRAKE	Manufacturers Standard		part of SAG Mill package	Fixed	0.3	0.3
130	132-ZM-006	1	0	SAG MILL TRUNNION BEARING LUBRICATION SYSTEM	Manufacturers Standard		part of SAG Mill package			
130	132-PP-003	1	0	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 1	Manufacturers Standard		part of SAG Mill package	Fixed	30.0	30.0

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
130	132-PP-004	1	1	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 2	Manufacturers Standard		part of SAG Mill package	Fixed	30.0	
130	132-PP-012	1	1	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 3	Manufacturers Standard		part of SAG Mill package	Fixed	30.0	
130	132-PP-006	1	0	SAG MILL TRUNNION BEARING LUBRICATION OIL RECIRCULATION PUMP 1	Manufacturers Standard		part of SAG Mill package	Fixed	15.0	15.0
130	132-PP-007	1	1	SAG MILL TRUNNION BEARING LUBRICATION OIL RECIRCULATION PUMP 2	Manufacturers Standard		part of SAG Mill package	Fixed	15.0	
130	132-ZM-007	5	0	SAG MILL TRUNNION BEARING LUBRICATION IMMERSION BAR HEATER	Manufacturers Standard		part of SAG Mill package	Feeder	1.5	7.5
130	132-ZM-008	1	0	SAG MILL REDUCER/ PINION BEARING LUBRICATION SYSTEM	Manufacturers Standard		part of SAG Mill package			
130	132-PP-008	1	0	SAG MILL REDUCER/ PINION BEARING LUBRICATION PUMP 1	Manufacturers Standard		part of SAG Mill package	Fixed	18.5	18.5
130	132-PP-009	1	1	SAG MILL REDUCER/ PINION BEARING LUBRICATION PUMP 2	Manufacturers Standard		part of SAG Mill package	Fixed	18.5	
130	132-ZM-009	6	0	SAG MILL REDUCER/ PINION BEARING LUBRICATION IMMERSION BAR HEATER	Manufacturers Standard		part of SAG Mill package	Feeder	1.5	9.0
130	132-ZM-010	1	0	SAG MILL LINER HANDLER	Manufacturers Standard		c/w hydraulic power pack.	Feeder	30.0	30.0
130	132-ZM-012	1	0	SAG MILL THUNDERBOLT	Manufacturers Standard					
130	132-ZM-011	1	0	SAG MILL GUARDS			-			
130	132-CH-002	1	0	SAG MILL DISCHARGE CHUTE	Mild Steel (12 mm nat. rubber lined)		-			
130	132-LA-001	1	0	SAG MILL DISCHARGE LAUNDER	Mild Steel (12 mm nat. rubber lined)		-			
130	132-CH-003	1	0	SAG MILL TROMMEL COVER	Mild Steel (epoxy painted)		-			
130	132-HP-001	1	0	SAG MILL DISCHARGE HOPPER	Mild Steel (12 mm nat. rubber lined)		-			
130	132-CH-007	1	0	SAG MILL FEED END CLEANUP CHUTE	Mild Steel		c/w grate cover			
130	132-CH-008	1	0	SAG MILL TROMMEL UNDERSIZE CHUTE	Mild Steel (12 mm nat. rubber lined)		-			
130	132-PP-010	1	0	MILLING AREA SUMP PUMP 1	Manufacturers Standard	65 m3/h @ 20m TDH, Slurry SG 1.2	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly	Fixed	15.0	15.0
130	132-CN-002	1	0	MILLING AREA DRIVE IN SUMP HOIST	Manufacturers Standard		Manual chain hoist			
AREA 130 / FACILITY 133 - CLASSIFICATION (CYCLONES)										
130	133-PP-001	1	0	CYCLONE FEED PUMP 1	High Chrome Cast Iron Impeller and Casing	1126 m3/h @ 32 m TDH	All metal construction heavy duty slurry pump c/w direct drive arrangement, drive guard and motor, 3.5 m3/h gland water	Variable	250.0	250.0
130	133-PP-002	1	1	CYCLONE FEED PUMP 2	High Chrome Cast Iron Impeller and Casing	1126 m3/h @ 32 m TDH	All metal construction heavy duty slurry pump c/w direct drive arrangement, drive guard and motor, 3.5 m3/h gland water	Variable	250.0	
130	133-CS-001	1	0	CYCLONE CLUSTER	Manufacturers Standard	712 m3/hr capacity, 63% w/w solids, S.G 1.66	14 cluster made of 11 operating, 3 standby 6 off manual & 8off pneumatically activated isolated valves, lockable 12mm FRP launder covers, access platform			
130	133-LA-001	1	0	CYCLONE U/F LAUNDER	Mild Steel (rubber lined)		part of Cyclone Cluster package			
130	133-LA-002	1	0	CYCLONE O/F LAUNDER	Mild Steel (rubber lined)		part of Cyclone Cluster package			
130	133-CN-001	1	0	CYCLONE AREA DAVIT CRANE	Manufacturers Standard		-	Feeder	5.5	5.5
AREA 130 / FACILITY 134 - GRAVITY CONCENTRATION										
AREA 130 / FACILITY 136 - RECYCLE CRUSHING										
AREA 140 / FACILITY 141- TRASH SCREENING										
140	141-BX-001	1	0	TRASH SCREEN FEED BOX	Mild Steel (6 mm nat. rubber lined)		-			
140	141-SC-001	1	0	TRASH SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Polyurethane deck material c/w isolation frame	Fixed	2 x 9	18.0
140	141-CH-001	1	0	TRASH SCREEN O/S CHUTE	Mild Steel		-			
140	141-CH-002	1	0	TRASH SCREEN U/S CHUTE	Mild Steel (6 mm nat. rubber lined)		-			
140	141-BN-001	1	0	TRASH BIN	Mild Steel		-			
AREA 140 / FACILITY 142- FEED THICKENING										
AREA 160 / FACILITY 162- CIL										
160	162-BX-001	1	0	CIL FEED DISTRIBUTION BOX	Mild Steel (6 mm nat. rubber lined)	-	-			
160	162-TK-001	1	0	CIL TANK 1	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-001	1	0	CIL TANK 1 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 440 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging	Fixed	75.0	75.0
160	162-SC-001	1	0	CIL TANK 1 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-001	1	0	CIL TANK 1 DISCHARGE LAUNDER	Mild Steel	-	-			
160	162-PP-001	1	0	CIL TANK 1 CARBON RECOVERY PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration 15 g/L	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed impeller.	Fixed	11.0	11.0
160	162-TK-002	1	0	CIL TANK 2	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-002	1	0	CIL TANK 2 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 330 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging	Fixed	75.0	75.0
160	162-SC-002	1	0	CIL TANK 2 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-002	1	0	CIL TANK 2 DISCHARGE LAUNDER	Mild Steel	-	-			

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
160	162-LA-003	1	0	CIL TANK 2 BYPASS LAUNDER	Mild Steel					
160	162-PP-002	1	0	CIL TANK 2 CARBON RECOVERY PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration 15 g/L	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed impeller.	Fixed	11.0	11.0
160	162-TK-003	1	0	CIL TANK 3	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-003	1	0	CIL TANK 3 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 220 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging.	Fixed	75.0	75.0
160	162-SC-003	1	0	CIL TANK 3 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-004	1	0	CIL TANK 3 DISCHARGE LAUNDER	Mild Steel	-	-			
160	162-LA-005	1	0	CIL TANK 3 BYPASS LAUNDER	Mild Steel					
160	162-PP-003	1	0	CIL TANK 3 CARBON ADVANCE PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration 15 g/L	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed impeller.	Fixed	11.0	11.0
160	162-TK-004	1	0	CIL TANK 4	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-004	1	0	CIL TANK 4 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 220 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging.	Fixed	75.0	75.0
160	162-SC-004	1	0	CIL TANK 4 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-006	1	0	CIL TANK 4 DISCHARGE LAUNDER	Mild Steel	-	-			
160	162-LA-007	1	0	CIL TANK 4 BYPASS LAUNDER	Mild Steel					
160	162-PP-004	1	0	CIL TANK 4 CARBON ADVANCE PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration 15 g/L	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed impeller.	Fixed	11.0	11.0
160	162-TK-005	1	0	CIL TANK 5	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-005	1	0	CIL TANK 5 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 220 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging.	Fixed	75.0	75.0
160	162-SC-005	1	0	CIL TANK 5 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-008	1	0	CIL TANK 5 DISCHARGE LAUNDER	Mild Steel	-	-			
160	162-LA-009	1	0	CIL TANK 5 BYPASS LAUNDER	Mild Steel					
160	162-PP-005	1	0	CIL TANK 5 CARBON ADVANCE PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration 15 g/L	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed impeller.	Fixed	11.0	11.0
160	162-TK-006	1	0	CIL TANK 6	Mild Steel	1600 m3 live capacity	Bolted construction, 3 baffles, 0.7 m freeboard			
160	162-AG-006	1	0	CIL TANK 6 AGITATOR	Manufacturers Standard	Solid suspension and gas dispersion of 220 Nm3/hr	Carbon steel shaft with rubber encapsulated impellers. Double stage impellers. Downshaft air sparging.	Fixed	75.0	75.0
160	162-SC-006	1	0	CIL TANK 6 INTERTANK SCREEN	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor	Fixed	4.0	4.0
160	162-LA-010	1	0	CIL TANK 6 DISCHARGE LAUNDER	Mild Steel	-	-			
160	162-LA-011	1	0	CIL TANK 6 BYPASS LAUNDER	Mild Steel					
160	162-LA-012	1	0	CIL DISCHARGE LAUNDER	Mild Steel					
160	162-PP-006	1	0	CIL TANK 6 CARBON ADVANCE PUMP	High Chrome Cast Iron Impeller and Casing	100 m3/h @ 8m TDH, Slurry SG 1.48, Carbon Concentration	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting. Recessed	Fixed	11.0	11.0
160	162-CN-001	1	0	CIL AREA GANTRY CRANE	Manufacturers Standard	7.5 t capacity , 16 m span, 42 m travel, 23 m lift	c/w siren	Feeder	34.6	34.6
160	162-PP-007	1	0	CIL AREA SUMP PUMP 1	Rubber lined casing Metal Impeller	65 m3/h @ 20m TDH, Slurry SG 1.2	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Pump hung from hoist.	Fixed	15.0	15.0
160	162-PP-008	1	0	CIL AREA SUMP PUMP 2	Rubber lined casing Metal Impeller	65 m3/h @ 20m TDH, Slurry SG 1.2	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Pump hung from hoist.	Fixed	15.0	15.0
160	162-CN-002	1	0	CIL AREA SUMP PUMP HOIST 1	Manufacturers Standard		Manual chain hoist			
160	162-CN-003	1	0	CIL AREA SUMP PUMP HOIST 2	Manufacturers Standard		Manual chain hoist			
160	162-SC-007	1	1	CIL INTERTANK SCREEN - SPARE	Manufacturers Standard	338 m3/h @ 46% w/w solids	Wedgewire, 304 SS, 833 microns aperture, c/w SEW KHF107 Drive Unit and WEG Motor -	Fixed	4.0	
160	162-ZM-001	1	0	CIL HIGH PRESSURE CLEANER	Manufacturers Standard	0.6 m3/hr capacity, 1300 m TDH	32A outlet			
AREA 170 / FACILITY 171- CARBON RECOVERY										
170	171-BX-001	1	0	LOADED CARBON RECOVERY SCREEN FEED BOX	Mild Steel (6 mm nat. rubber lined)	-	-			
170	171-SC-001	1	0	LOADED CARBON RECOVERY SCREEN	Manufacturers Standard	100 m3/h total flow rate	Polyurethane deck material c/w isolation frame and spray bars	Fixed	2 x 1.1	2.2
170	171-CH-001	1	0	LOADED CARBON RECOVERY SCREEN O/S CHUTE	Mild Steel (6 mm nat. rubber lined)	-	-			
170	171-CH-002	1	0	LOADED CARBON RECOVERY SCREEN U/S CHUTE	Mild Steel (6 mm nat. rubber lined)	-	-			
AREA 170 / FACILITY 172- ACID WASH										
170	172-CM-001	1	0	ACID WASH COLUMN	Mild Steel (rubber lined)	6 tonne carbon/ strip	Boiler plate construction per AS1210 c/w butyl rubber lining and all appurtenances.			
170	172-FL-001	1	0	ACID WASH FILTER 1	Various	-	PVC or SS construction c/w 316 SS 250 µm insertion baskets.			
170	172-FL-002	1	0	ACID WASH FILTER 2	Various	-	PVC or SS construction c/w 316 SS 250 µm insertion baskets.			
170	172-ZM-001	1	0	ACID WASH FILTERS DRIP TRAY	SS304L	-	-			
AREA 170 / FACILITY 173- ELUTION										

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
170	173-CM-001	1	0	ELUTION COLUMN	SS304L	6 tonne carbon/ strip	Grade 304L stainless steel construction per AS1210 c/w insulation, cladding and all			
170	173-FL-001	1	0	ELUATE FILTER 1	SS304	-	Grade 304 stainless steel construction c/w 250 µm insertion baskets.			
170	173-FL-002	1	0	ELUATE FILTER 2	SS304	-	Grade 304 stainless steel construction c/w 250 µm insertion baskets.			
170	173-ZM-001	1	0	ELUATE FILTERS DRIP TRAY	SS304L	-	-			
170	173-HX-001	1	0	STRIP SOLUTION HEATER	Various	1150 kW heating capacity	Diesel-fired thermal oil heater c/w modulating controller	Feeder	1.5	1.5
170	173-SX-001	1	0	ELUTION HEATER EXHAUST STACK	SS316L	-	-			
170	173-FL-003	1	0	STRIP SOLUTION HEATER DIESEL FUEL FILTER 1	Manufacturers Standard	-	Part of Strip Solution Heater Vendor Package			
170	173-FL-004	1	0	STRIP SOLUTION HEATER DIESEL FUEL FILTER 2	Manufacturers Standard	-	Part of Strip Solution Heater Vendor Package			
170	173-HX-002	1	0	STRIP SOLUTION HEATER PRIMARY HEAT EXCHANGER	SS316	-	Part of Strip Solution Heater Vendor package. Plate type c/w grade 316 stainless steel plates and EPDM gaskets			
170	173-HX-003	1	0	STRIP SOLUTION HEATER HEAT RECOVERY HEAT EXCHANGER	SS316	-	Part of Strip Solution Heater Vendor package. Plate type c/w grade 316 stainless steel plates and EPDM gaskets			
170	173-PP-001	1	0	THERMAL OIL CIRCULATION PUMP	Manufacturers Standard	-	Part of Strip Solution Heater Vendor Package	Fixed	7.5	7.5
170	173-TK-001	1	0	THERMAL HEATER EXPANSION TANK	Mild Steel	-	Part of Strip Solution Heater Vendor Package			
170	173-PP-002	1	0	SULPHAMIC ACID PUMP	Manufacturers Standard	2.4m3/h, 25m TDH	Hose Pump, EPDM hose	Fixed	1.5	1.5
170	173-TK-002	1	0	STRIP SOLUTION TANK	SS304L	17 m3 live capacity	Mild steel construction c/w insulation and cladding.			
170	173-PP-003	1	0	STRIPPING SOLUTION PUMP	Manufacturers Standard	48 m3/h, 105m TDH, SG 1.05	Centrifugal pump c/w direct coupled motor, flexible coupling, guard, base-metal free seals and rigid baseplate	Variable	22.0	22.0
170	173-PP-004	1	0	STRIPPING WATER ANTISCALANT PUMP	PVDF	-	-	Fixed	0.1	0.1
170	173-PP-005	1	0	ELUTION SUMP PUMP	Rubber lined casing Metal Impeller	22 m3/h @ 28m TDH, Slurry SG 1.0	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Pump hung from hoist.	Fixed	7.5	7.5
AREA 170 / FACILITY 174- CARBON REGENERATION										
170	174-BX-001	1	0	CARBON DEWATERING SCREEN FEED BOX						
170	174-SC-001	1	0	CARBON DEWATERING SCREEN	Manufacturers Standard	52 m3/h total flow rate	Part of carbon regeneration kiln package.	Fixed	1.1	1.1
170	174-CH-001	1	0	CARBON DEWATERING SCREEN O/S CHUTE						
170	174-CH-002	1	0	CARBON DEWATERING SCREEN U/S CHUTE						
170	174-HP-001	1	0	CARBON REGENERATION KILN FEED HOPPER	Mild Steel	9t carbon capacity	Part of carbon regeneration kiln package complete with support structure			
170	174-SC-002	1	0	CARBON KILN PIPE SCREEN	Various	-	Part of carbon regeneration kiln package			
170	174-HP-002	1	0	CARBON KILN PRE-DRYER	Manufacturers Standard	-	Part of carbon regeneration kiln package			
170	174-FA-001	1	0	CARBON KILN PRE-DRYER FAN			Part of carbon regeneration kiln package			
170	174-FE-001	1	0	CARBON KILN SCREW FEEDER	SS304L	0.3 t/h capacity, 0.47 t/m3 bulk density, 3 mm top size	Part of carbon regeneration kiln package c/w VSD supplied by kiln supplier	Feeder	0.6	0.6
170	174-KN-001	1	0	CARBON REGENERATION KILN	Various	300 kg/hr, horizontal, Diesel	Diesel kiln c/w exhaust stack, control panel, motor starters, VSD's	Feeder	3.8	3.8
170	174-DU-001	1	0	CARBON KILN FUME DUCTING						
170	174-BX-002	1	0	CARBON QUENCH TANK						
170	174-SC-003	1	0	CARBON SIZING SCREEN	Manufacturers Standard	-	Part of carbon regeneration kiln package	Feeder	0.6	0.6
170	174-CH-003	1	0	CARBON SIZING SCREEN O/S CHUTE						
170	174-CH-004	1	0	CARBON SIZING SCREEN U/S CHUTE						
AREA 170 / FACILITY 175 - INTENSE CYANIDATION										
AREA 170 / FACILITY 176 - ELECTROWINNING										
170	176-VS-001	1	0	FLASH VESSEL	SS304L	50 litre live capacity	-			
170	176-CL-001	1	0	CIL ELECTROWINNING CELL 1	SS304L	22 cathodes per cell	-			
170	176-CL-002	1	0	CIL ELECTROWINNING CELL 2	SS304L	22 cathodes per cell	-			
170	176-RC-001	1	0	ELECTROWINNING CELL 1 RECTIFIER	Manufacturers Standard	3,500 amps x 10 volts	-	Feeder	35.0	35.0
170	176-RC-002	1	0	ELECTROWINNING CELL 2 RECTIFIER	Manufacturers Standard	3,500 amps x 10 volts	-	Feeder	35.0	35.0
170	176-ZM-001	1	0	ANODE LIFTING FRAME	Mild Steel	-	-			
170	176-ZM-002	1	0	ANODE HOLDING RACK	Mild Steel	-	-			
170	176-DU-001	1	0	ELECTROWINNING CELL FUME DUCTING	SS304L	-	-			
170	176-FA-001	1	0	ELECTROWINNING CELL FUME EXTRACTION FAN	Manufacturers Standard	3,700 m3/h @ 750 Pa TSP @ 70 °C	Upblast position / vee-belt driven	Fixed	2.2	2.2
170	176-SX-001	1	0	ELECTROWINNING FUME EXTRACTION STACK	SS304L	-	-			
170	176-ZM-006	1	1	CATHODE HIGH PRESSURE WASH SPRAY MACHINE	Manufacturers Standard	0.6 m3/hr capacity, 1300 m TDH, 1 SG	-	Feeder	2.2	
AREA 170 / FACILITY 177 - GOLDROOM & SMELTING										
170	177-CN-001	1	0	GOLD ROOM CRANE	Manufacturers Standard	2 t capacity, 8.6 m span, 18 m travel, 9 m lift	-	Feeder	6.7	6.7
170	177-FA-001	1	0	GOLDROOM ROOF FAN 1	Manufacturers Standard	12,000 m3/h @ 65 Pa. TSP @ 25-45 °C	Roof Fan	Fixed	1.5	1.5
170	177-FA-002	1	0	GOLDROOM ROOF FAN 2	Manufacturers Standard	12,000 m3/h @ 65 Pa. TSP @ 25-45 °C	Roof Fan	Fixed	1.5	1.5
170	177-FA-003	1	0	GOLDROOM ROOF FAN 3	Manufacturers Standard	12,000 m3/h @ 65 Pa. TSP @ 25-45 °C	Roof Fan	Fixed	1.5	1.5
170	177-FA-004	1	0	GOLDROOM ROOF FAN 4	Manufacturers Standard	12,000 m3/h @ 65 Pa. TSP @ 25-45 °C	Roof Fan	Fixed	1.5	1.5
170	177-FL-001	1	0	CELL SLUDGE PAN FILTER	Manufacturers Standard	38 litres per batch	-			
170	177-ZM-001	1	0	PAN FILTER VACUUM SYSTEM	Manufacturers Standard	-	Part of Pan Filter			

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
170	177-PP-001	1	0	PAN FILTER VACUUM PUMP	Manufacturers Standard	-	Part of Pan Filter	Fixed	4.0	4.0
170	177-TK-001	1	0	VACUUM PUMP SEAL TANK	Manufacturers Standard	-	Part of Pan Filter			
170	177-VS-001	1	0	PAN FILTER VACUUM PUMP PRESSURE VESSEL	Manufacturers Standard	-	Part of Pan Filter			
170	177-PP-002	1	0	GOLD ROOM SUMP PUMP	Manufacturers Standard	22 m3/h @ 28m TDH, Slurry SG 1.1	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting.	Fixed	7.5	7.5
170	177-DR-001	1	0	DRYING OVEN	Manufacturers Standard	750 deg. C - operating temperature / 1000 deg. C - Oven Maximum Temperature	c/w tray trolley and lifting frame	Feeder	6 x 4kW	24.0
170	177-ST-001	1	0	DRYING OVEN FUME HOOD	Mild Steel	-	-			
170	177-FC-001	1	0	BARRING FURNACE	Manufacturers Standard	200 kg brass capacity	Diesel fired c/w tilting mechanism. A200 unit.	Feeder	0.6	0.6
170	177-FL-002	1	0	BARRING FURNACE DIESEL FILTER 1	Manufacturers Standard	-	Part of Barring Furnace package			
170	177-FL-003	1	1	BARRING FURNACE DIESEL FILTER 2	Manufacturers Standard	-	Part of Barring Furnace package			
170	177-ST-002	1	0	FURNACE FUME HOOD	Mild Steel	-	-			
170	177-FA-005	1	0	FURNACE EXTRACTION FAN	Mild Steel	6,200 m3/h @ 500 Pa. TSP @ 70°C	Upblast position / direct driven	Fixed	2.2	2.2
170	177-SX-001	1	0	FURNACE EXTRACTION STACK	Mild Steel	-	-			
170	177-ZM-002	1	0	POURING MOULDS	Cast Iron	-	Part of Barring Furnace package			
170	177-ZM-003	1	0	BULLION BALANCE	Manufacturers Standard	34 kg capacity, +/- 0.1 g accuracy	-			
170	177-ZM-004	1	0	FLUX SCALES	Manufacturers Standard	34 kg capacity, +/- 0.1 g accuracy	-			
170	177-ZM-005	1	0	GOLDROOM SAFE	Manufacturers Standard	0.6 m3 capacity	-			
170	177-ZM-006	1	0	VAULT DOOR	Manufacturers Standard	150 mm thick vault door	-			
170	177-ZM-007	1	0	GOLDROOM DOUBLE SECURITY DOORS	Various	-	-			
170	177-ZM-008	1	0	GOLDROOM EXTERNAL PERSONNEL DOOR	Various	-	-			
170	177-ZM-009	1	0	GOLDROOM INTERNAL PERSONNEL DOOR	Various	-	-			
170	177-ZM-010	1	0	PRILL BALANCE	Manufacturers Standard		-			
170	177-MO-001	1	0	GOLDROOM CCTV MONITOR	Manufacturers Standard					
170	177-CA-001	1	0	GOLDROOM CCTV CAMERA 1	Manufacturers Standard					
170	177-CA-002	1	0	GOLDROOM CCTV CAMERA 2	Manufacturers Standard					
170	177-CA-003	1	0	GOLDROOM CCTV CAMERA 3	Manufacturers Standard					
AREA 180 / FACILITY 181 - CARBON SAFETY SCREENING										
180	181-BX-001	1	0	CARBON SAFETY SCREEN FEED BOX	Mild Steel (6 mm nat. rubber lined)					
180	181-SC-001	1	0	CARBON SAFETY SCREEN	Manufacturers Standard	353 m3/h total flow rate	Polyurethane deck material, cross flow, c/w isolation frame and spray bar	Fixed	2 x 7.5	15.0
180	181-CH-001	1	0	CARBON SAFETY SCREEN O/S CHUTE	Mild Steel					
180	181-BN-001	1	0	FINE CARBON COLLECTION BIN	Mild Steel					
180	181-CH-002	1	0	CARBON SAFETY SCREEN U/S CHUTE	Mild Steel (6 mm nat. rubber lined)					
AREA 180 / FACILITY 183 - DETOXIFICATION										
180	183-BX-001	1	0	CYANIDE DESTRUCTION FEED BOX	Mild Steel (6 mm nat. rubber lined)		c/w isolation and weir gates			
180	183-TK-001	1	0	CYANIDE DESTRUCTION TANK 1	Mild Steel	60 mins residence @ 276 m3/h	operating volume 180 m3, Flat bottomed, agitated tank, 3 baffles (5.93 High x 0.510m Width), including 1.3m freeboard. Fully welded construction			
180	183-AG-001	1	0	CYANIDE DESTRUCTION TANK 1 AGITATOR	Manufacturers Standard		Rubber encapsulated carbon steel shaft and propeller. Double stage propeller	Fixed	55.0	55.0
180	183-ZM-001	1	0	CYANIDE DESTRUCTION TANK 1 AIR SPARGER	SS316		Air sparger design by agitator vendor			
180	183-TK-002	1	0	CYANIDE DESTRUCTION TANK 2	Mild Steel	60 mins residence @ 276 m3/h	operating volume 180 m3, Flat bottomed, agitated tank, 3 baffles (5.93 High x 0.510m Width), including 1.3m freeboard. Fully welded construction			
180	183-AG-002	1	0	CYANIDE DESTRUCTION TANK 2 AGITATOR	Manufacturers Standard	__ m3 tank capacity, single/dual stage impeller	Rubber encapsulated carbon steel shaft and propeller. Double stage propeller	Fixed	55.0	55.0
180	183-ZM-002	1	0	CYANIDE DESTRUCTION TANK 2 AIR SPARGER	SS316		Air sparger design by agitator vendor			
180	183-LA-001	1	0	CYANIDE DESTRUCTION DISCHARGE LAUNDER	Mild Steel (6 mm nat. rubber lined)					
180	183-HP-002	1	0	CYANIDE DESTRUCTION DISCHARGE HOPPER	Mild Steel (6 mm nat. rubber lined)		c/w isolation and weir gates			
180	183-PP-001	1	0	CYANIDE DESTRUCTION SUMP PUMP	Manufacturers Standard	65 m3/h @ 20m TDH, Slurry SG 1.2	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting.	Fixed	15.0	15.0
180	183-CN-001	1	0	CYANIDE DESTRUCTION SUMP PUMP HOIST	Manufacturers Standard		Manual chain hoist			
180	183-PP-002	1	0	CYANIDE DESTRUCTION DISCHARGE PUMP 1	Manufacturers Standard	398 m3/h @ -10 m TDH, Slurry SG 1.37	Heavy duty slurry pump c/w vee-belt drive arrangement, drive guard and motor	Variable	90.0	90.0
180	183-PP-003	1	1	CYANIDE DESTRUCTION DISCHARGE PUMP 2	Manufacturers Standard	398 m3/h @ -10 m TDH, Slurry SG 1.37	Heavy duty slurry pump c/w vee-belt drive arrangement, drive guard and motor	Variable	90.0	
180	183-SA-001	1	0	CYANIDE DESTRUCTION DISCHARGE SAMPLER	Manufacturers Standard					
AREA 210 / FACILITY 211 - CYANIDE										
210	211-CN-001	1	0	CYANIDE HOIST	Manufacturers Standard	2 t capacity, 12 m travel, 10 m lift	-	Feeder	5.6	5.6
210	211-ST-001	1	0	CYANIDE BULK BAG LIFTING FRAME	Mild Steel	2 tonne	c/w 2 tonne lifting lug			
210	211-ZM-001	1	0	CYANIDE BAG BREAKER	Mild Steel	-	-			
210	211-TK-001	1	0	CYANIDE MIXING TANK	Mild Steel	15m3 live capacity	0.3 m freeboard			
210	211-AG-001	1	0	CYANIDE MIXING TANK AGITATOR	Manufacturers Standard	Mixing	Grade 316 stainless steel shaft and propeller. Single stage propeller	Fixed	1.1	1.1

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
210	211-PP-001	1	0	CYANIDE TRANSFER PUMP	Manufacturers Standard	15 m3/hr capacity, 5 m TDH, 1.18 SG	Centrifugal pump c/w direct coupled motor, flexible coupling, guard, base-metal free seals and rigid	Fixed	1.1	1.1
210	211-TK-002	1	0	CYANIDE STORAGE TANK	Mild Steel	25 m3 live capacity	0.5 m freeboard			
210	211-PP-002	1	0	CYANIDE CIRCULATION PUMP 1	Manufacturers Standard	10 m3/hr capacity, 23 m TDH, 1.1 SG	Centrifugal pump c/w direct coupled motor, flexible coupling, guard, base-metal free seals and rigid	Fixed	1.5	1.5
210	211-PP-003	1	1	CYANIDE CIRCULATION PUMP 2	Manufacturers Standard	10 m3/hr capacity, 23 m TDH, 1.1 SG	Centrifugal pump c/w direct coupled motor, flexible coupling, guard, base-metal free seals and rigid	Fixed	1.5	
210	211-PP-004	1	0	CYANIDE DOSING PUMP	Manufacturers Standard	1 m3/hr capacity, 20 m TDH, 1.10 SG	4 pole motor, Direct Coupled. Grade 316 stainless steel rotor and EPDM stator	Fixed	1.1	1.1
210	211-PP-005	1	0	CYANIDE AREA SUMP PUMP	Manufacturers Standard	22 m3/h @ 20m TDH, Slurry SG 1.0	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting.	Fixed	7.5	7.5
AREA 210 / FACILITY 212 - LIME										
210	212-BN-001	1	0	LIME SILO	Mild Steel	11 tonne live capacity	5t storage, 2.4 dia x 2.4 high wall, 60 degree cone, c/w top of bin platform and access ladder			
210	212-VB-001	1	0	LIME SILO BIN ACTIVATOR	Manufacturers Standard	40-500 kg/hr	1520mm dia x 200mm outlet	Fixed	0.4	0.4
210	212-ZM-001	1	0	LIME SILO ROTARY VALVE	Manufacturers Standard	40-500 kg/hr	Range 40-264 kg/h, 200mm inlet & outlet c/w forced cooling fan	Variable	0.4	0.4
210	212-FA-001	1	0	LIME SILO ROTARY VALVE FAN	Manufacturers Standard			Fixed	0.4	0.4
210	212-ST-001	1	0	LIME BAG LIFTING FRAME	Mild Steel	-	-			
210	212-ZM-002	1	0	LIME BAG BREAKER	Mild Steel	-				
210	212-CN-001	1	0	LIME HOIST	Manufacturers Standard	2 t capacity, 5 m travel, 15 m lift	1.5t SWL, wire rope, dual speed, 5m lift, 8m travel c/w festooning	Feeder	6.0	6.0
210	212-DC-001	1	0	LIME SILO DUST COLLECTOR	Manufacturers Standard	1,700 Am3/hr at 1.5 kPa	Insertable, reverse pulse, bag collector	Fixed	5.5	5.5
AREA 210 / FACILITY 213 - FLOCCULANT										
AREA 210 / FACILITY 214 - ACID & CAUSTIC										
210	214-PP-001	1	0	HYDROCHLORIC ACID DRUM PUMP	Manufacturers Standard	5 m3/hr capacity, 5 m TDH, 1.16 SG	EPDM Hose Peristaltic Pump c/w gearbox and 4 pole motor.	Fixed	0.0	
210	214-TK-001	1	0	HYDROCHLORIC ACID STORAGE TANK	HDPE	10 m3	Fibreglass, 0.3 m freeboard			
210	214-PP-002	1	0	HYDROCHLORIC ACID PUMP	Manufacturers Standard	38 m3/hr capacity, 22 m TDH, 1.01 SG	Mag drive pump, ETFE+CF casing and impeller. 2 pole motor	Fixed	7.5	7.5
210	214-PP-003	1	0	ACID AREA SUMP PUMP	Manufacturers Standard	22 m3/h @ 20m TDH, Slurry SG 1.0	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting.	Fixed	7.5	7.5
210	214-HP-001	1	0	CAUSTIC FEED HOPPER	SS316L	-	c/w manual rotary feeder			
210	214-ZM-002	1	0	CAUSTIC ROTARY VALVE	Manufacturers Standard		Manual Rotary Feeder			
210	214-ST-001	1	0	CAUSTIC BAG LIFTING FRAME	Mild Steel					
210	214-TK-002	1	0	CAUSTIC MIXING / STORAGE TANK	Mild Steel	15 m3 live capacity	-			
210	214-AG-001	1	0	CAUSTIC MIXING AGITATOR	Manufacturers Standard	Mixing	Grade 316 stainless steel shaft and propeller. Single stage propeller	Fixed	1.1	1.1
210	214-PP-004	1	0	ELUTION CAUSTIC DOSING PUMP	Manufacturers Standard	8 m3/hr capacity, 20 m TDH, 1.08 SG	Progressive cavity c/w grade 316 stainless steel rotor and EPDM stator	Fixed	7.5	7.5
210	214-PP-005	1	0	CYANIDE DESTRUCTION CAUSTIC DOSING PUMP	Manufacturers Standard	0.5 to 1 m3/hr capacity, 20 m TDH, 1.08 SG	Progressive cavity c/w grade 316 stainless steel rotor and EPDM stator	Variable	1.1	1.1
AREA 210 / FACILITY 216 - SODIUM METABISULPHITE										
210	216-CN-001	1	0	SMBS HOIST	Manufacturers Standard	2 t capacity, 5 m travel, 9 m lift	-	Feeder	5.6	5.6
210	216-ST-001	1	0	SMBS BAG LIFTING FRAME	Mild Steel	-	-			
210	216-ZM-001	1	0	SMBS BAG BREAKER	SS316L	-	-			
210	216-TK-001	1	0	SMBS MIXING TANK	SS316L	15 m3 live capacity	0.3 m freeboard			
210	216-AG-001	1	0	SMBS MIXING TANK AGITATOR	Manufacturers Standard	Mixing	Grade 316 stainless steel shaft and propeller. Single stage propeller	Fixed	1.1	1.1
210	216-PP-001	1	0	SMBS TRANSFER PUMP	Manufacturers Standard	15 m3/hr capacity, 5 m TDH, 1.18 SG	4 pole motor, Direct Coupled	Fixed	1.5	1.5
210	216-TK-002	1	0	SMBS STORAGE TANK	SS316L	25 m3 live capacity	0.3 m freeboard			
210	216-FA-001	1	0	SMBS TANKS VENTILATION FAN	Manufacturers Standard	3400 m3/hr @ 120 Pa	Ventilation of SMBS Mix and Storage Tanks	Fixed	0.8	0.8
210	216-PP-002	1	0	SMBS DOSING PUMP 1	Manufacturers Standard	0.5 to 2.2 m3/h at 20 m TDH, SG 1.18	Progressive cavity c/w grade 316 stainless steel rotor and EPDM stator	Variable	1.5	1.5
210	216-PP-003	1	1	SMBS DOSING PUMP 2	Manufacturers Standard	0.5 to 2.2 m3/h at 20 m TDH, SG 1.18	Progressive cavity c/w grade 316 stainless steel rotor and EPDM stator	Variable	1.5	
210	216-PP-004	1	0	SMBS AREA SUMP PUMP	Manufacturers Standard	22 m3/h @ 20m TDH, Slurry SG 1.0	c/w drive guard, CV drive configuration, fixed speed vee-belt drive assembly. Fixed mounting.	Fixed	7.5	7.5
AREA 210 / FACILITY 217 - REAGENTS GENERAL										
210	217-ZM-001	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 1	Manufacturers Standard					
210	217-ZM-002	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 2	Manufacturers Standard					
210	217-ZM-003	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 3	Manufacturers Standard					
210	217-ZM-004	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 4	Manufacturers Standard					
210	217-ZM-005	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 5	Manufacturers Standard					
210	217-ZM-006	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 6	Manufacturers Standard					
210	217-ZM-007	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 7	Manufacturers Standard					
210	217-ZM-008	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 8	Manufacturers Standard					
210	217-ZM-009	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 9	Manufacturers Standard					
210	217-ZM-010	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 10	Manufacturers Standard					
210	217-ZM-011	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 11	Manufacturers Standard					

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
210	217-ZM-012	1	0	REAGENTS STORAGE STRUCTURE CONTAINER 12	Manufacturers Standard					
210	217-ZM-013	1	0	REAGENTS STORAGE DOME ROOM 1	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-014	1	0	REAGENTS STORAGE DOME ROOM 2	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-015	1	0	REAGENTS STORAGE DOME ROOM 3	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-016	1	0	REAGENTS STORAGE DOME ROOM 4	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-017	1	0	REAGENTS STORAGE DOME ROOM 5	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-018	1	0	REAGENTS STORAGE DOME ROOM 6	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-019	1	0	REAGENTS STORAGE DOME ROOM 7	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-020	1	0	REAGENTS STORAGE DOME ROOM 8	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-021	1	0	REAGENTS STORAGE DOME ROOM 9	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
210	217-ZM-022	1	0	REAGENTS STORAGE DOME ROOM 10	Manufacturers Standard		Dome Shelter with enclosed end wall and door			
AREA 210 / FACILITY 219 - COPPER SULPHATE										
210	219-HP-001	1	0	COPPER SULPHATE FEED HOPPER	SS316L	-	c/w manual rotary feeder			
210	219-ZM-002	1	0	COPPER SULPHATE ROTARY VALVE	Manufacturers Standard		Manual Rotary Feeder			
210	219-TK-001	1	0	COPPER SULPHATE MIXING / STORAGE TANK	SS316L	5 m3 live capacity	0.3 m freeboard			
210	219-AG-001	1	0	COPPER SULPHATE MIXING TANK AGITATOR	Manufacturers Standard	Mixing	Grade 316 stainless steel shaft and propeller. Single stage propeller	Fixed	0.6	0.6
210	219-PP-001	1	0	COPPER SULPHATE DOSING PUMP 1	Manufacturers Standard	0.4 to 1.1 m3/h at 20 m TDH, SG1.15	Progressive cavity c/w grade 316 stainless steel rotor and EPDM stator	Variable	1.1	1.1
AREA 220 / FACILITY 222 - RAW WATER										
220	222-TK-001	1	0	RAW WATER TANK	Mild Steel	1000 m3 live capacity	Bolted construction			
220	222-FL-001	1	0	RAW WATER TANK DISCHARGE FILTER	Various	-	-			
220	222-PP-004	1	0	RAW WATER PUMP 1	Manufacturers Standard	227 m3/h capacity, 56 m TDH, 1.0 SG	Centrifugal pump c/w direct coupled motor, flexible coupling, guard and rigid baseplate	Fixed	55.0	55.0
220	222-PP-005	1	0	RAW WATER PUMP 2	Manufacturers Standard	227 m3/h capacity, 56 m TDH, 1.0 SG	Centrifugal pump c/w direct coupled motor, flexible coupling, guard and rigid baseplate	Fixed	55.0	55.0
AREA 220 / FACILITY 223 - PROCESS WATER										
220	223-TK-001	1	0	PROCESS WATER TANK	Mild Steel	500 m3 live capacity	Bolted construction			
220	223-PP-001	1	0	PROCESS WATER PUMP 1	Manufacturers Standard	311 m3/hr, 40 m TDH, 1.0 SG	Gland-sealed centrifugal pump c/w direct coupled motor, flexible coupling, guard and rigid baseplate.	Fixed	132.0	132.0
220	223-PP-002	1	1	PROCESS WATER PUMP 2	Manufacturers Standard	311 m3/hr, 40 m TDH, 1.0 SG	Gland-sealed centrifugal pump c/w direct coupled motor, flexible coupling, guard and rigid baseplate.	Fixed	132.0	
AREA 220 / FACILITY 224 - POTABLE WATER										
220	224-TK-001	1	0	POTABLE WATER STORAGE TANK	Mild Steel	50 m3 Live Capacity	0.5 m freeboard			
220	224-PP-001	1	0	PLANT POTABLE WATER PUMP 1	Manufacturers Standard	5 m3/h capacity, 60 m TDH	Skid-mounted system complete with control panel, pressure transducers, valving, manifold etc. Maintains constant 450kPa pressure in the system.	Feeder	2.2	2.2
220	224-PP-002	1	1	PLANT POTABLE WATER PUMP 2	Manufacturers Standard	5 m3/h capacity, 60 m TDH	Skid-mounted system complete with control panel, pressure transducers, valving, manifold etc. Maintains constant 450kPa pressure in the system.	Feeder	2.2	
220	224-VS-001	1	0	PLANT POTABLE WATER ACCUMULATOR	Manufacturers Standard	-				
220	224-ES-001	1	0	WATER TREATMENT SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-002	1	0	SMBS AREA LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-003	1	0	SMBS AREA UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-004	1	0	DETOX LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-005	1	0	DETOX UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-006	1	0	DIESEL UNLOADING SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-007	1	0	CIL LOWER SAFETY SHOWER 1	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-008	1	0	CYANIDE AREA LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-009	1	0	CYANIDE AREA UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-010	1	0	CAUSTIC AREA SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-011	1	0	ACID UNLOADING SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-012	1	0	ACID WASH COLUMN LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-013	1	0	ELUTION COLUMN TOP SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-014	1	0	CIL UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-015	1	0	CARBON REGENERATION SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-016	1	0	STRIP SOLUTION AREA SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-017	1	0	GOLDROOM LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-018	1	0	GOLDROOM UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-019	1	0	CIL AREA LOWER SAFETY SHOWER 2	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-020	1	0	SAG MILL FEED SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-021	1	0	CYCLONE CLUSTER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
220	224-ES-022	1	0	MILL DISCHARGE HOPPER LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-023	1	0	LIME AREA LOWER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-024	1	0	LIME AREA UPPER SAFETY SHOWER	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve			
220	224-ES-025	1	0	CRUSHING AREA SAFETY SHOWER - PORTABLE	SS316	4.56 m3/h - shower / 0.90 m3/h - eye wash @ 130 kPa	Combination Safety Shower and Eyewash c/w Anti-Scald valve - Portable Unit.			
AREA 220 / FACILITY 225 - GLAND SEALING WATER										
220	225-FL-001	1	0	GLAND WATER PUMP 1 FILTER	Various	-	-			
220	225-PP-001	1	0	GLAND WATER PUMP 1	Manufacturers Standard	10 m3/h capacity, 90 m TDH	Vertical centrifugal pump c/w direct coupled motor, guard and rigid baseplate	Fixed	5.5	5.5
220	225-FL-002	1	0	GLAND WATER PUMP 2 FILTER	Various	-	-			
220	225-PP-002	1	1	GLAND WATER PUMP 2	Manufacturers Standard	10 m3/h capacity, 90 m TDH	Vertical centrifugal pump c/w direct coupled motor, guard and rigid baseplate	Fixed	5.5	
AREA 220 / FACILITY 226 - COOLING WATER										
220	226-HX-001	1	0	COOLING TOWER	Various	-	Cooling tower c/w fan	Fixed	11.0	11.0
220	226-PP-001	1	0	COOLING TOWER RECIRCULATION PUMP 1	Manufacturers Standard	-	Part of Cooling Tower package	Fixed	15.0	15.0
220	226-PP-002	1	1	COOLING TOWER RECIRCULATION PUMP 2	Manufacturers Standard	-	Part of Cooling Tower package	Fixed	15.0	
220	226-FL-001	1	0	COOLING TOWER FILTER	Manufacturers Standard	-	Part of Cooling Tower package			
220	226-PP-003	1	0	COOLING WATER PUMP 1	Manufacturers Standard	-	-	Fixed	11.0	11.0
220	226-PP-004	1	0	COOLING WATER PUMP 2	Manufacturers Standard	-	-	Fixed	11.0	11.0
220	226-HX-002	1	0	COOLING WATER HEAT EXCHANGER	Various	-	Part of Cooling Tower package			
220	226-PP-005	1	0	COOLING WATER BIOCIDE DOSING PUMP	Manufacturers Standard	-	Part of Cooling Tower package	Fixed	0.6	0.6
220	226-PP-006	1	0	COOLING WATER ANTISCALANT DOSING PUMP	Manufacturers Standard	-	Part of Cooling Tower package	Fixed	0.6	0.6
AREA 220 / FACILITY 228 - FIRE WATER										
220	228-FL-001	1	0	FIRE WATER SUCTION FILTER	Manufacturers Standard		Part of Fire Protection Pump skid			
220	228-PP-001	1	0	FIRE WATER JOCKEY PUMP	Cast Iron Casing, Stainless Steel Impeller	1 m3/hr capacity, 70 m TDH, 1 SG	Part of Fire Protection Pump skid	Feeder	1.1	1.1
220	228-PP-002	1	0	FIRE WATER PUMP (ELECTRIC)	Cast Iron	120 m3/hr capacity, 73 m TDH, 1 SG	Part of Fire Protection Pump skid	Feeder	55.0	55.0
220	228-PP-003	1	0	FIRE WATER PUMP (DIESEL)	Cast Iron	120 m3/hr capacity, 73 m TDH, 1 SG	Part of Fire Protection Pump skid. Direct coupled diesel driven c/w diesel engine			
220	228-VS-001	1	0	FIRE WATER ACCUMULATOR	Manufacturers Standard	-	Part of Fire Protection Pump skid			
220	228-HR-001 - 020	20	0	FIRE WATER HOSE REELS	Various	Min flow:0.45 @ 220 kPA	c/w nozzle, reel isolation valve, and 36 m hose			
220	228-FH-001 - 010	10	0	FIRE WATER HYDRANTS	Various	50 m3/hr per hose, 2 hoses per hydrant, max 1000 kPa	c/w cabinet, 2 x 25m hoses c/w nozzles 7-off hydrants c/w foamer kit			
AREA 230 / FACILITY 232 - WATER TREATMENT PLANTS										
230	232-TE-001	1	0	PLANT POTABLE WATER TREATMENT PLANT	Various	3 m3/hr potable water capacity	-	Feeder	10+0.1	10.1
230	232-ZM-001	1	0	UV STERILISER	Manufacturers Standard	-	Part of Water Treatment package			
230	232-ZM-002	1	1	UV STERILISER	Manufacturers Standard	-	Part of Water Treatment package			
AREA 230 / FACILITY 233 - SEWAGE COLLECTION & TREATMENT										
230	233-PP-001	1	0	SEWAGE MACERATOR PUMP STATION 1	Various	10 m3/h capacity, 20 m TDH	Number and arrangement of sewage forwarding pumps to be confirmed	Feeder	1.5	1.5
230	233-PP-002	1	0	SEWAGE MACERATOR PUMP STATION 2	Various	10 m3/h capacity, 20 m TDH	Number and arrangement of sewage forwarding pumps to be confirmed	Feeder	1.5	1.5
230	233-TE-001	1	0	SEWAGE TREATMENT PLANT	Manufacturers Standard	350 personnel @ 130L per person per day	-	Feeder	11.0	11.0
230	233-TK-001	1	0	GREY WATER SURGE TANK	Mild Steel	15 m3 capacity	Part of STP package			
230	233-PP-004	1	0	GREY WATER TRANSFER PUMP	Cast Iron	8 m3/h capacity, 20 m TDH	Part of STP package			
230	233-TK-002	1	0	TREATED SLUDGE TANK	Mild Steel	-	Part of STP package			
AREA 240 / FACILITY 241 - COMPRESSED AIR										
240	241-CO-001	1	0	PLANT AIR COMPRESSOR 1	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Direct drive, oil Injected, air cooled air compressor c/w air inlet and outlet filters	Feeder	75.0	75.0
240	241-CO-002	1	1	PLANT AIR COMPRESSOR 2	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Direct drive, oil Injected, air cooled air compressor c/w air inlet and outlet filters	Feeder	75.0	
240	241-FL-001	1	1	PLANT COMPRESSOR 1 FILTER 1	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Part of Compressed Air Systems Package			
240	241-FL-002	1	1	PLANT COMPRESSOR 1 FILTER 2	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Part of Compressed Air Systems Package			
240	241-FL-003	1	1	PLANT COMPRESSOR 2 FILTER 1	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Part of Compressed Air Systems Package			
240	241-FL-004	1	1	PLANT COMPRESSOR 2 FILTER 2	Manufacturers Standard	550 Am3/h FAD @ 700 kPag	Part of Compressed Air Systems Package			
240	241-VS-001	1	0	PLANT AIR RECEIVER	Mild Steel	3 m3 live capacity	c/w spring loaded safety valve, pressure gauge, manual drain valve and automatic condensate drain.			
240	241-DR-001	1	0	PLANT AIR DRYER 1	Manufacturers Standard	550 m3/hr FAD @ 700 kPa / 5°C Discharge Temp. / 3°C Dew Point temp.	Part of Compressed Air Systems Package	Feeder	2.0	2.0
240	241-DR-002	1	1	PLANT AIR DRYER 2	Manufacturers Standard	550 m3/hr FAD @ 700 kPa / 5°C Discharge Temp. / 3°C Dew Point temp.	Part of Compressed Air Systems Package	Feeder	2.0	
240	241-VS-002	1	0	CRUSHING AREA AIR RECEIVER	Mild Steel	3 m3 live capacity	c/w spring loaded safety valve, pressure gauge, manual drain valve and automatic condensate drain.			
240	241-VS-003	1	0	GRINDING AREA AIR RECEIVER	Mild Steel	3 m3 live capacity	c/w spring loaded safety valve, pressure gauge, manual drain valve and automatic condensate drain.			

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
AREA 240 / FACILITY 242 - BLOWER AIR										
250	242-BL-001	1	0	CIL & CYANIDE AIR BLOWER 1	Manufacturers Standard	1089 Nm3/hr FAD @ 225 kPag	Air cooled, single stage centrifugal , 100% oil free, direct drive, complete with integral after cooler and inlet filter.	Fixed	132.0	132.0
250	242-BL-002	1	1	CIL & CYANIDE AIR BLOWER 2	Manufacturers Standard	1089 Nm3/hr FAD @ 225 kPag	Swing standby unit. Air cooled, single stage centrifugal , 100% oil free, direct drive, complete with integral after cooler and inlet filter.	Fixed	132.0	
250	242-BL-003	1	0	CIL & CYANIDE AIR BLOWER 3	Manufacturers Standard	1089 Nm3/hr FAD @ 150 kPag	Swing standby unit. Air cooled, single stage centrifugal , 100% oil free, direct drive, complete with integral after cooler and inlet filter.	Fixed	132.0	132.0
AREA 250 / FACILITY 251 - FUEL STORAGE & DISTRIBUTION										
250	251-TK-001	1	0	PLANT DIESEL DAY TANK	Mild Steel	5 m3 live capacity	Self bunded tank Final details to be confirmed.			
250	251-PP-001	1	0	DIESEL DISTRIBUTION PUMP	Manufacturers Standard	5 m3/h capacity, 25 m TDH	Final details to be confirmed.	Fixed	0.8	0.8
250	251-FL-001	1	0	POST DAY TANK DIESEL FILTER 1	Various	5 m3/h @ 250 kPa, 100 micron filter aperture	Final details to be confirmed.			
250	251-FL-002	1	1	POST DAY TANK DIESEL FILTER 2	Various	5 m3/h @ 250 kPa, 100 micron filter aperture	Final details to be confirmed.			
250	251-TK-002	1	0	DIESEL CONSTANT HEAD TANK	Mild Steel	0.5 m3 live capacity	Self bunded tank Final details to be confirmed.			
AREA 330 / FACILITY 331 - RAW WATER SUPPLY										
330	331--001	1	0	RAW WATER DIVERSION DAM	Manufacturers Standard					
330	331-PP-001	1	0	RAW WATER DAM PUMP 1	Manufacturers Standard	333 m3/h capacity, 39 m TDH	Submersible pump c/w pontoon	Fixed	115.0	115.0
330	331-PP-002	1	1	RAW WATER DAM PUMP 2 - SPARE	Manufacturers Standard	333 m3/h capacity, 39 m TDH	Submersible pump ONLY - Un-Installed Spare	Fixed	115.0	
330	331-ZM-001	1	0	RAW WATER PUMP PONTOON	Manufacturers Standard					
AREA 350 / FACILITY 351 - TAILINGS DAM										
350	351-PP-001	1	0	TMF UNDERDRAINAGE PUMP	Manufacturers Standard	1 m3/h capacity, 20 m TDH	Design by others	Fixed	0.4	0.4
350	351-PP-002	1	0	TMF SEEPAGE PUMP	Manufacturers Standard	25 m3/h capacity, 40 m TDH	Design by others	Fixed	0.4	0.4
AREA 350 / FACILITY 353 - DECANT SYSTEM										
350	353-PP-001	1	0	DECANT RETURN PUMP 1	Manufacturers Standard	333 m3/h capacity, 44 m TDH	Submersible pump c/w pontoon	Fixed	115.0	115.0
350	353-PP-002	1	1	DECANT RETURN PUMP 2 - SPARE	Manufacturers Standard	333 m3/h capacity, 44 m TDH	Submersible pump ONLY - Un-Installed Spare	Fixed	115.0	
350	353-ZM-001	1	0	DECANT PUMP PONTOON	Manufacturers Standard					

Plant Area	Facility	Equipment Name	Number	Size	Materials of Construction	Notes/Comments	Supplier	GA No.	Detail Dwg No.
AREA 370 - PLANT BUILDINGS									
370 Process Plant Buildings	370 Plant Gatehouse	PLANT GATEHOUSE	1 No.	16 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-GH-002-01			
370 Process Plant Buildings	370 Security Gatehouse and Changeroom	SECURITY GATEHOUSE AND CHANGEROOM	1 No.	321 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-GH-001-01			
370 Process Plant Buildings	370 Dining Room / Conference Room	DINING ROOM / CONFERENCE ROOM	1 No.	90 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-IM-001-01			
370 Process Plant Buildings	370 Mine Warehouse (incl. Workshop)	MINE WAREHOUSE & WORKSHOP	1 No.	1203 m^2	Steel frame c/w sheeting.	DAP Drawing No. SE-Q-WB-002-01			
370 Process Plant Buildings	370 Mine Office	MINE WAREHOUSE OFFICES	1 No.	315 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-WB-001-01			
370 Process Plant Buildings	370 Control Room	CONTROL ROOM	1 Lot	2 x 14 m^2	Prefabricated containerised building	DAP Drawing No. CC-Q-CR-001-01			
370 Process Plant Buildings	370 Laboratory	LABORATORY	1 Lot	63 m^2	Concrete Slab Only (150mm thick)	Based on Client's Supplied Dwg HQ-O-54804 (Mammut Building Systems) [10.5m x 6m]			
370 Process Plant Buildings	370 Reagents Storage Shed	REAGENTS STORAGE SHED	1 No.	10 off 9m x 12.25m bays	12 x 40' Sea Containers c/w domed roof shelters	DAP Drawing No. CC-Q-W-001-01			
370 Process Plant Buildings	370 Flammable Store	FLAMMABLE STORE	1 No.	8' x 40'	40' Sea Container	DAP Drawing No. CC-Q-S-001-01			
370 Process Plant Buildings	370 Acid Store	ACID STORE	2 No.	2 x 8' x 40'	40' Sea Container	DAP Drawing No. CC-Q-S-001-01			
370 Process Plant Buildings	370 First Aid Clinic	CLINIC AND EMERGENCY RESPONSE BUILDING	1 No.	132 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-CE-001-01			
370 Process Plant Buildings	370 Metallurgical Building	METALLURGICAL BUILDING	1 No.	198 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-MB-001-01			
370 Process Plant Buildings	370 Mine/Plant Admin Building	MINE/PLANT OFFICES	1 No.	492 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-AD-001-01			
370 Process Plant Buildings	370 Ablutions	PLANT ABLUTIONS	1 No.	11 m^2	Prefabricated containerised building	DAP Drawing No. SE-Q-AB-001-01			

Plant Area	Equipment No.	Tot Qty	S/By Qty	Equipment Name	Matl of Constr. (incl. Lining)	Process Duty Point	Notes/Comments	Fixed/ Variable Speed	kW Inst.	kW Total
AREA 330 / FACILITY 332 - VILLAGE POTABLE WATER										
330	332-TK-001	1	0	VILLAGE POTABLE WATER STORAGE TANK	Mild Steel	50 m3 live capacity	Bolted construction	-	-	-
330	332-PP-001	1	0	VILLAGE POTABLE WATER PUMP 1	Manufacturers Standard	5 m3/h capacity, 60 m TDH	Skid-mounted system complete with control panel, pressure transducers, valving, manifold etc. Maintains constant 450kPa pressure in the system.	Feeder	2.2	2.2
330	332-PP-002	1	1	VILLAGE POTABLE WATER PUMP 2	Manufacturers Standard		Skid-mounted system complete with control panel, pressure transducers, valving, manifold etc. Maintains constant 450kPa pressure in the system.	Feeder	2.2	2.2
AREA 330 / FACILITY 333 - VILLAGE WATER TREATMENT										
330	333-TE-001	1	0	VILLAGE POTABLE WATER TREATMENT PLANT	Various	9.5 m3/hr potable water capacity	-	Feeder	10+0.1	10.1
330	333-ZM-001	1	0	UV STERILISER	Manufacturers Standard	-	Part of Water Treatment package			
330	333-ZM-002	1	1	UV STERILISER	Manufacturers Standard	-	Part of Water Treatment package			
AREA 360 / FACILITY 363 - GATEHOUSE										
360	363-CA-001	1	0	GATEHOUSE CCTV CAMERA						
360	363-MO-001	1	0	GATEHOUSE CCTV MONITOR						
AREA 380 / FACILITY 383 - VILLAGE FIRE WATER										
380	383-FL-001	1	0	FIRE WATER SUCTION FILTER	Manufacturers Standard		Part of Fire Protection Pump skid			
380	383-PP-001	1	0	FIRE WATER JOCKEY PUMP	Cast Iron Casing, Stainless Steel Impeller	1 m3/hr capacity, 70 m TDH, 1 SG	Part of Fire Protection Pump skid	Feeder	1.1	1.1
380	383-PP-002	1	0	FIRE WATER PUMP (ELECTRIC)	Cast Iron	120 m3/hr capacity, 73 m TDH, 1 SG	Part of Fire Protection Pump skid	Feeder	55.0	55.0
380	383-PP-003	1	0	FIRE WATER PUMP (DIESEL)	Cast Iron	120 m3/hr capacity, 73 m TDH, 1 SG	Part of Fire Protection Pump skid. Direct-coupled diesel driven, c/w diesel engine			
380	383-VS-001	1	0	FIRE WATER ACCUMULATOR	Manufacturers Standard	-	Part of Fire Protection Pump skid			
380	383-HR-001 - 020	5	0	FIRE WATER HOSE REELS	Various	-	c/w nozzle, reel isolation valve, and 36 m hose			
380	383-FH-001 - 010	5	0	FIRE WATER HYDRANTS	Various	-	c/w cabinet, 2 x 25m hoses c/w nozzles 7-off hydrants c/w foamer kit			
AREA 380 / FACILITY 384 - VILLAGE SEWAGE TREATMENT										
380	384-PP-001	1	0	VILLAGE SEWAGE MACERATOR PUMP STATION 1	Various	10 m3/h capacity, 20 m TDH	Number and arrangement of sewage forwarding pumps to be confirmed	Feeder	1.5	1.5
380	384-PP-002	1	0	VILLAGE SEWAGE MACERATOR PUMP STATION 2	Various	10 m3/h capacity, 20 m TDH	Number and arrangement of sewage forwarding pumps to be confirmed	Feeder	1.5	1.5
380	384-TE-001	1	0	VILLAGE SEWAGE TREATMENT PLANT	Manufacturers Standard	350 personnel @ 130L per person per day	-	Feeder	11.0	11.0
380	384-TK-001	1	0	GREY WATER SURGE TANK	Mild Steel	-	Part of STP package			
380	384-PP-003	1	0	GREY WATER TRANSFER PUMP	Cast Iron	8 m3/h capacity, 20 m TDH	Part of STP package			
380	384-TK-002	1	0	TREATED SLUDGE TANK	Mild Steel	-	Part of STP package			

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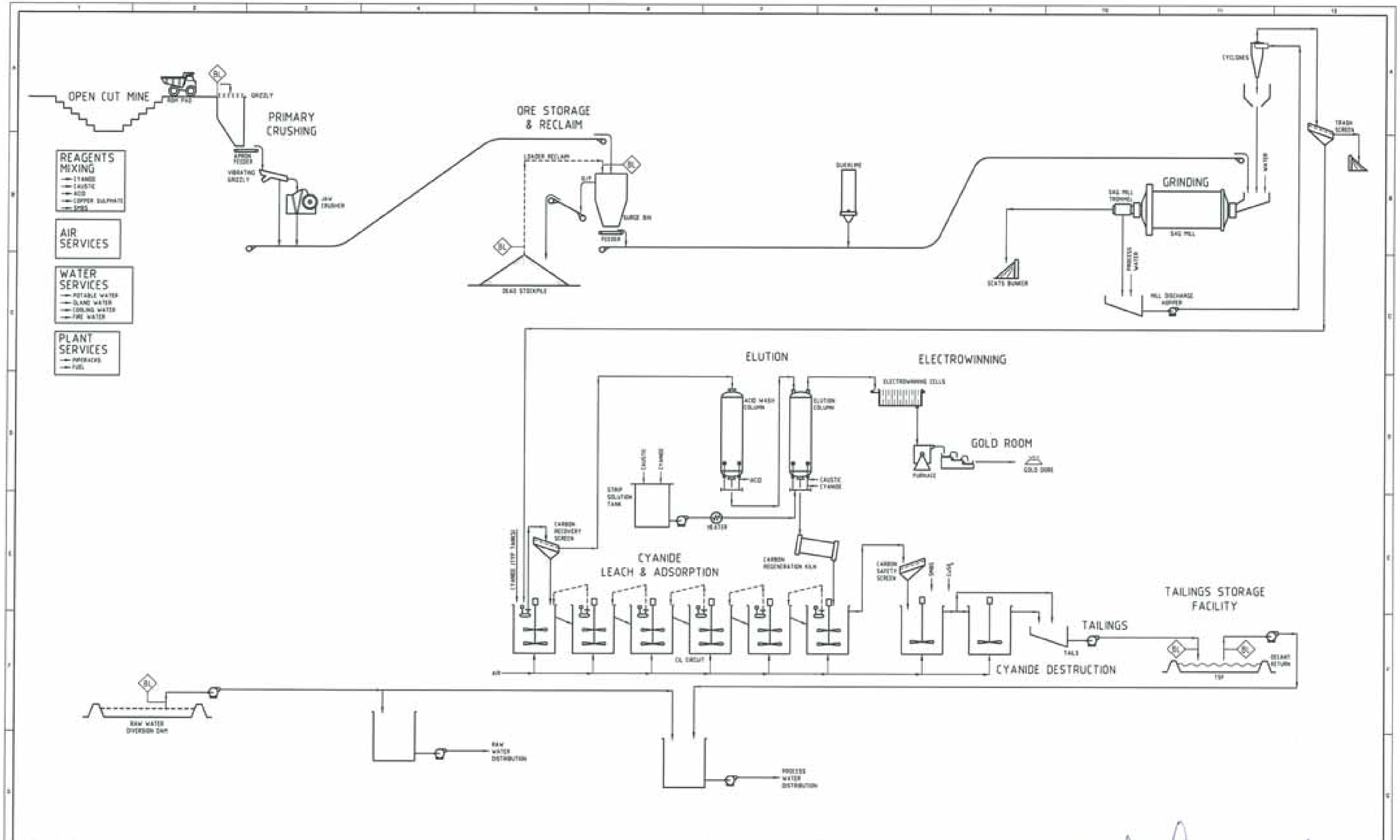
KEFI MINERALS ETHIOPIA PLC
TULU KAPI GOLD PROJECT

Village
Buildings List
Revision No: 1
Print Date: 30/09/2016

Plant Area	Facility	Equipment Name	Number	Size	Materials of Construction	Notes/Comments	Supplier	GA No.	Detail Dwg No.
AREA 380 - VILLAGE BUILDINGS									
380 Village Buildings	380 Gatehouse	GATEHOUSE	1 No.	16 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-GH-001-01			
380 Village Buildings	380 Management Unit	MANAGEMENT ACCOMMODATION UNIT	9 No.	315 m^2	Prefabricated modular type building of 9 units @ 35 sq.m each	DAP Drawing No. SE-Q-AC-001-01			
380 Village Buildings	380 Supervisory Accommodation (Type AC1)	ACCOMMODATION UNIT TYPE 1-AC 1	7 No.	1008 m^2	Prefabricated modular type building of 7 units @ 144 sq.m each	DAP Drawing No. SE-Q-AC-002-01			
380 Village Buildings	380 Supervisory Accommodation (Type AC2)	ACCOMMODATION UNIT TYPE 2-AC 2	21 No.	2709 m^2	Prefabricated modular type building of 21 units @ 129 sq.m each	DAP Drawing No. SE-Q-AC-003-01			
380 Village Buildings	380 Mess Area, Kitchen, Office and Storage Area	MESS AREA, KITCHEN, OFFICE AND STORAGE AREA	1 No.	795 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-KD-001-01			
380 Village Buildings	380 Recreational Facilities (General Staff)	RECREATIONAL FACILITIES	1 No.	141 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-R-001-01			
380 Village Buildings	380 Laundry and Ironing Block	LAUNDRY AND IRONING	1 No.	145 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-L-001-01			
AREA 450 - MINING FACILITIES BUILDINGS									
380 Village Buildings	380 Administration Block	ADMINISTRATION BLOCK	1 No.	129 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-AD-001-01			
380 Village Buildings	380 Recreation Block	RECREATION BLOCK	1 No.	141 m^2	Prefabricated modular type building	DAP Drawing No. SE-Q-R-002-01			

APPENDIX 6.3

PROCESS FLOW DIAGRAMS (PFDS)



LEGEND

------ INTERMITTENT

REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
C	26OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
B	25AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	06JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	HP	DD		DG	BR	

DRG No	REFERENCE DRAWINGS
XX	XXX

CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

Lycopodium

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE

TULU KAPI PLANT OVERVIEW
PROCESS FLOW DIAGRAM

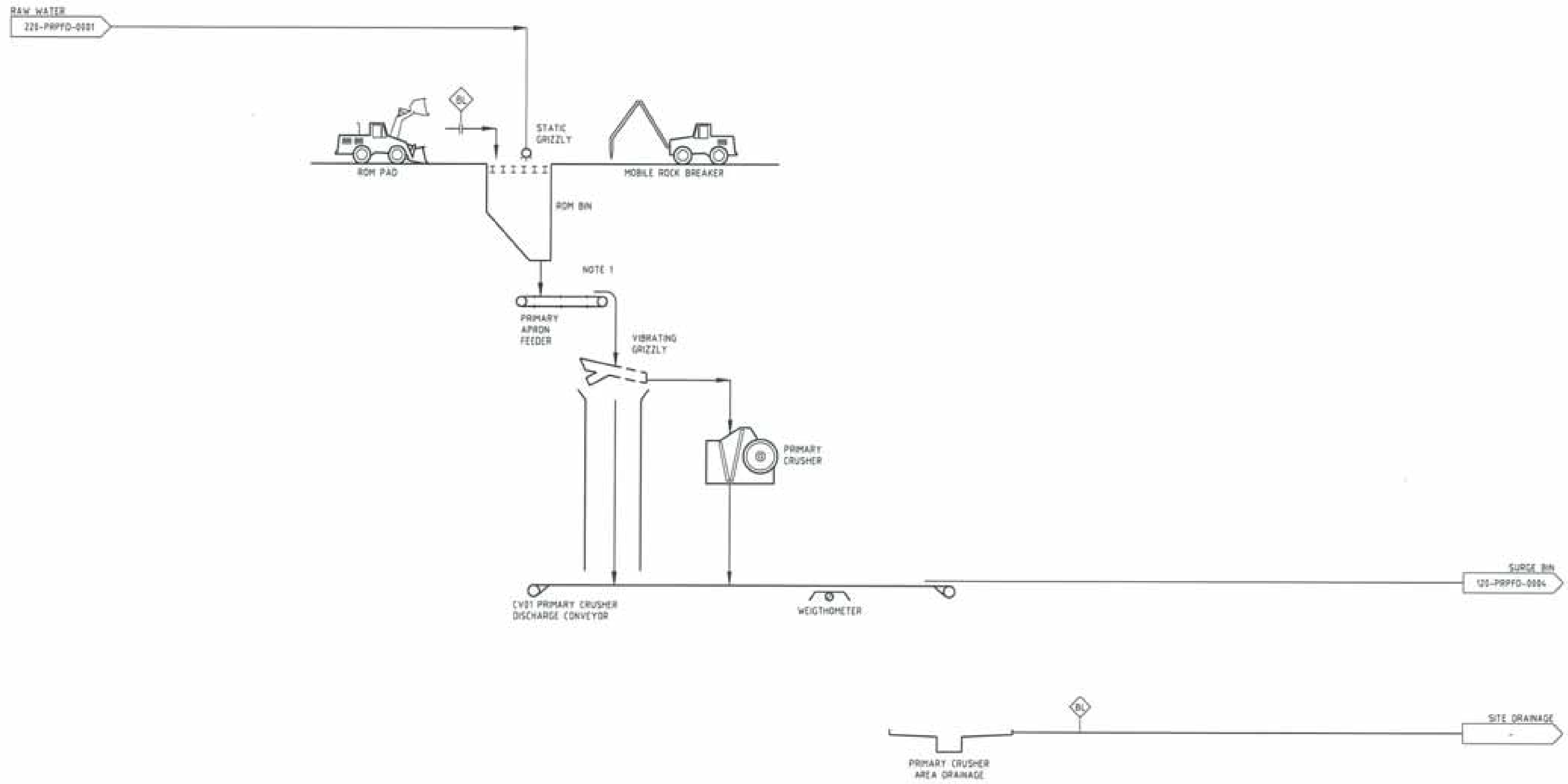
SCALE	JOB No.	DRG No.	REV
NTS	1953	110-PRPFD-0002	C

DRAWN	DATE
CB	28JUN16

A1

NOTES:

1. ALL MAINTENANCE BY MOBILE CRANE.



DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D
		C	26OCT16	REVISED TO ALIGN WITH CONTRACT	SL	MG	MG		DG	BR	
		B	25AUG16	ISSUED FOR FEED	CB		DS		DG	BR	
X.X	XXX	A	28JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GD		DG	BR	

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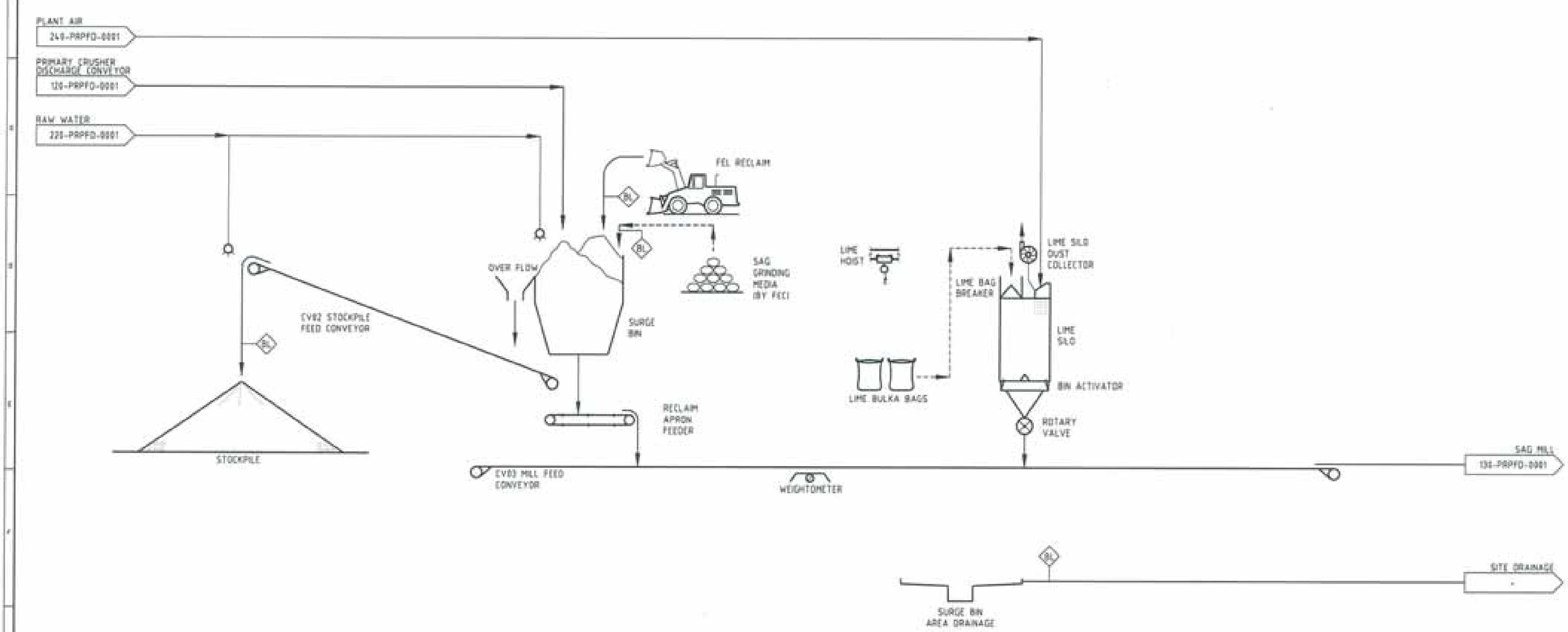
DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
FEED PREPARATION
PRIMARY CRUSHING
PROCESS FLOW DIAGRAM

SCALE		JOB No.	DRG No.	REV
NTS				
DRAWN CB	DATE 28JUN16	1953	120-PRPFD-0001	C

A1



REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D
C	30OCT16	REVISED TO ALIGN WITH CONTRACT	SL	MG	MG		DG	BR	
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	26JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DG		DG	BR	

DRG No.	REFERENCE DRAWINGS
XX	XXX

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PROJECT TULU KAPI GOLD PROJECT

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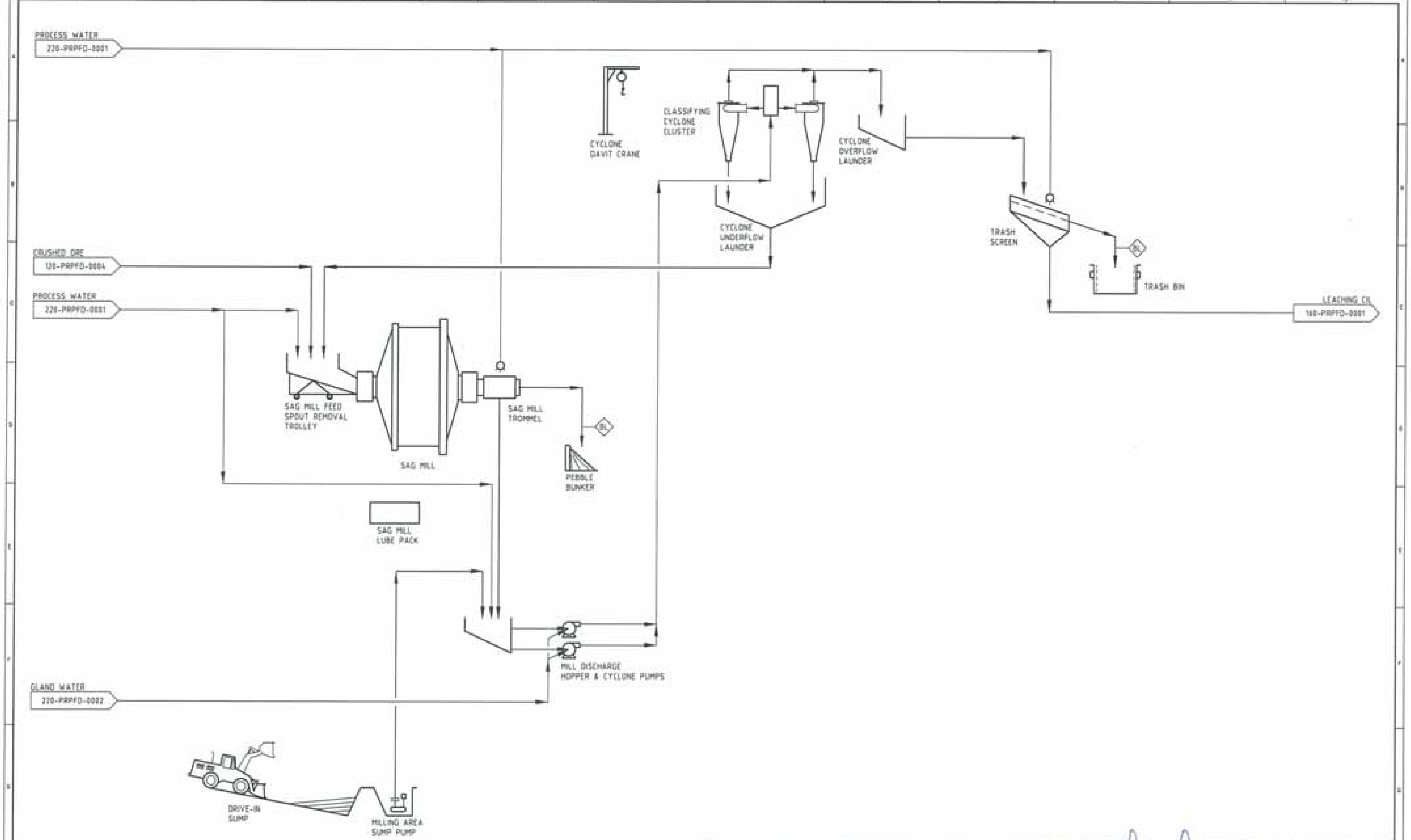
DRAWING TITLE
FEED PREPARATION
SURGE BIN AND LIME SILO
PROCESS FLOW DIAGRAM

SCALE	DRAWN	DATE	JOB No.	DRG No.	REV
NTS	CB	28JUN16	1953	120-PRPFD-0004	C

A1



DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
		C	26OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
		B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
XX	XXX	A	04-JUL-16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DD		DG	BR	

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
MILLING
SAG MILLING GRAVITY CONCENTRATION
PROCESS FLOW DIAGRAM

SCALE	JOB No	DRG No	REV
NTS			
DRAWN CB / DATE 28JUN16	1953	130-PRPFD-0001	C

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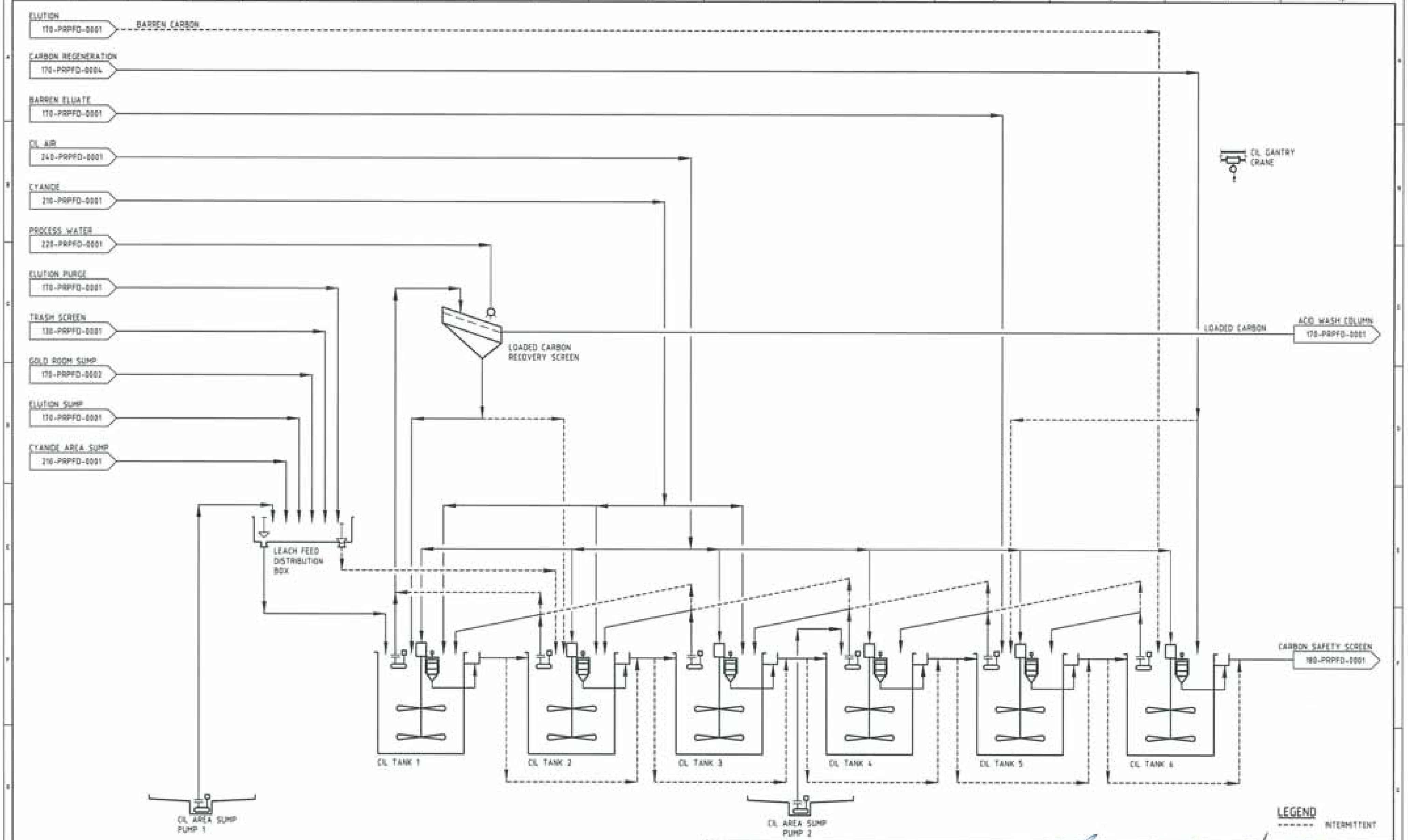

CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

Lycopodium

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DRAWING TITLE
LEACHING
CIL
PROCESS FLOW DIAGRAM

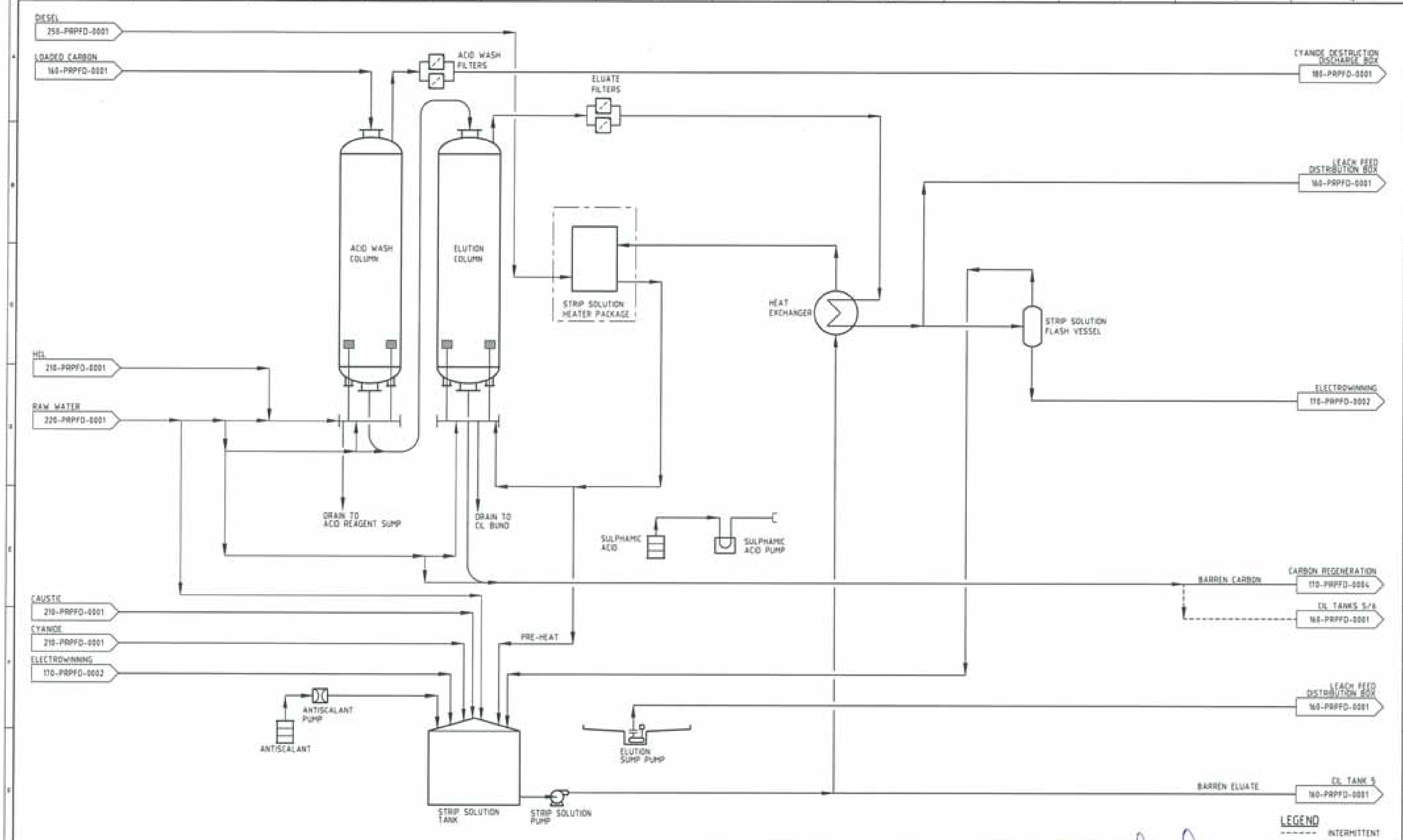
SCALE	JOB No.	DRG No.	REV.
NTS	1953	160-PRPFD-0001	B
DRAWN CB / DATE 29JUN16			

DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D
B	23AUG16	ISSUED FOR FEED	CB		DC		DC	BR	
A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DC		DC	BR	

DRG No.	REFERENCE DRAWINGS
XX	XXX

A1



CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

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KEFI MINERALS

DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
ELUTION AND GOLDROOM
ELUTION
PROCESS FLOW DIAGRAM

SCALE	JOB No.	DWG No.	REV.
NTS	1953	170-PRPFD-0001	C

DRAWN CB DATE 29JUN16

REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	RP	GD		DG	BR	

DWG No.	REFERENCE DRAWINGS
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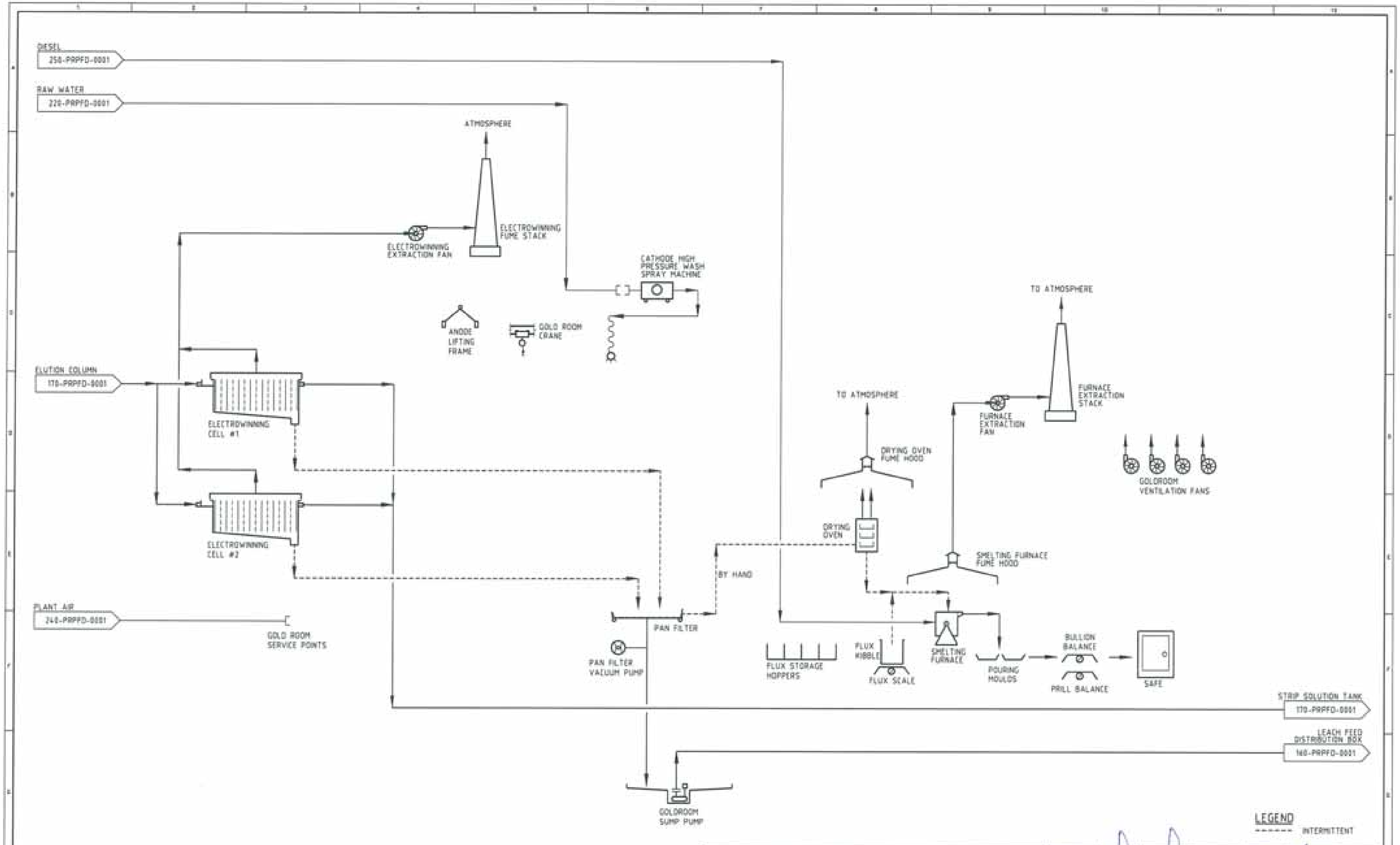

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		B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
XX	XXX	A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GO		DG	BR	
DWG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D

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PROJECT TULU KAPI GOLD PROJECT

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DRAWING TITLE
ELUTION AND GOLDROOM
ELECTROWINNING AND GOLDROOM
PROCESS FLOW DIAGRAM

SCALE NTS | DRAWN CB | DATE 29JUN16 | JOB No 1953 | DWG No 170-PRPFD-0002 | REV C

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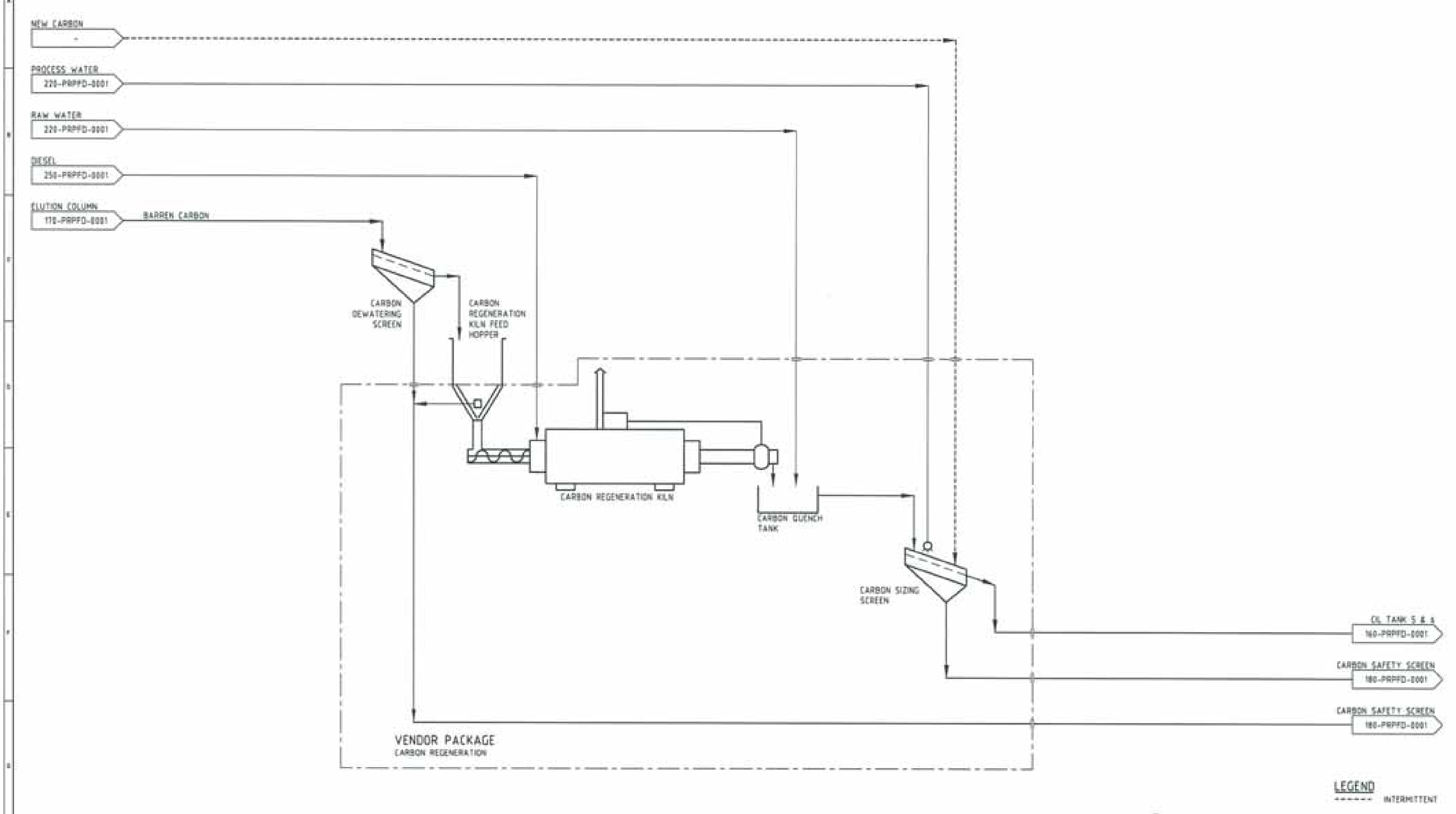

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XX	XXX	A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GD		DG	BR	
DRG No.	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

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PROJECT TULU KAPI GOLD PROJECT

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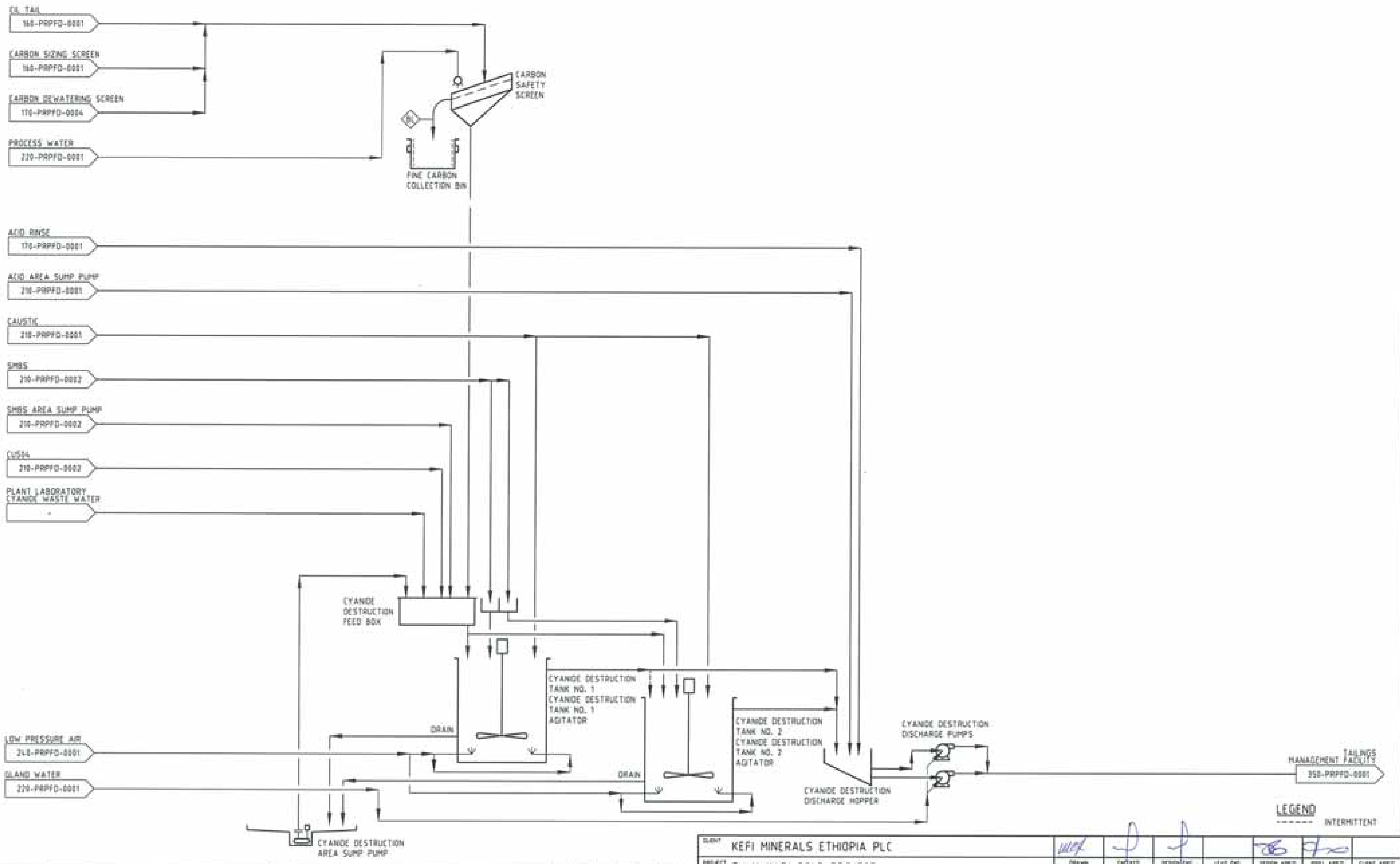
DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
ELUTION AND GOLDROOM
CARBON REGENERATION
PROCESS FLOW DIAGRAM

SCALE	DRAWN	DATE	JOB No.	DRG No.	REV.
NTS	CB	29JUN16	1953	170-PRPFD-0004	B

A1



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B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GD		DG	BR	

DRG No	REFERENCE DRAWINGS
XX	XXX

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DRAWING TITLE
TAILS HANDLING AND CYANIDE DESTRUCTION
CARBON SAFETY SCREEN
PROCESS FLOW DIAGRAM

DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

SCALE NTS

DRAWN CB | DATE 29JUN16 | JOB No 1953 | DRG No 180-PRPFD-0001 | REV C

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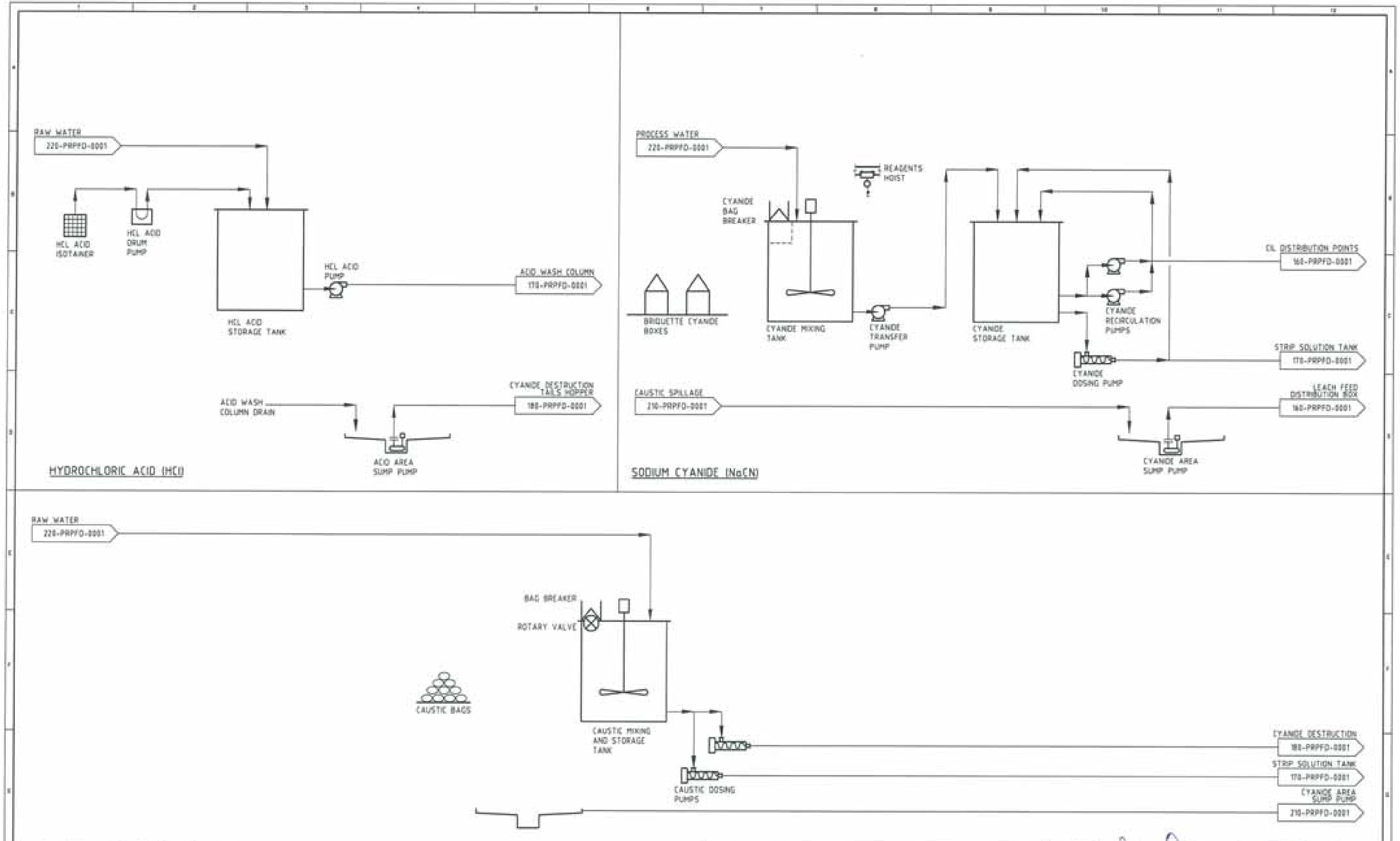

LEGEND

------ INTERMITTENT

DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
		C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
		B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
X.X	X.X.X	A	06JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DG		DG	BR	

CLIENT: KEFI MINERALS ETHIOPIA PLC

PROJECT: TULU KAPI GOLD PROJECT

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ APP'D	CLIENT APP'D

DRAWING TITLE: REAGENTS
REAGENTS SHEET 1 OF 2
PROCESS FLOW DIAGRAM

SCALE	DRAWN	DATE	JOB No.	DRG No.	REV
NTS	CB	29JUN16	1953	210-PRPFD-0001	C

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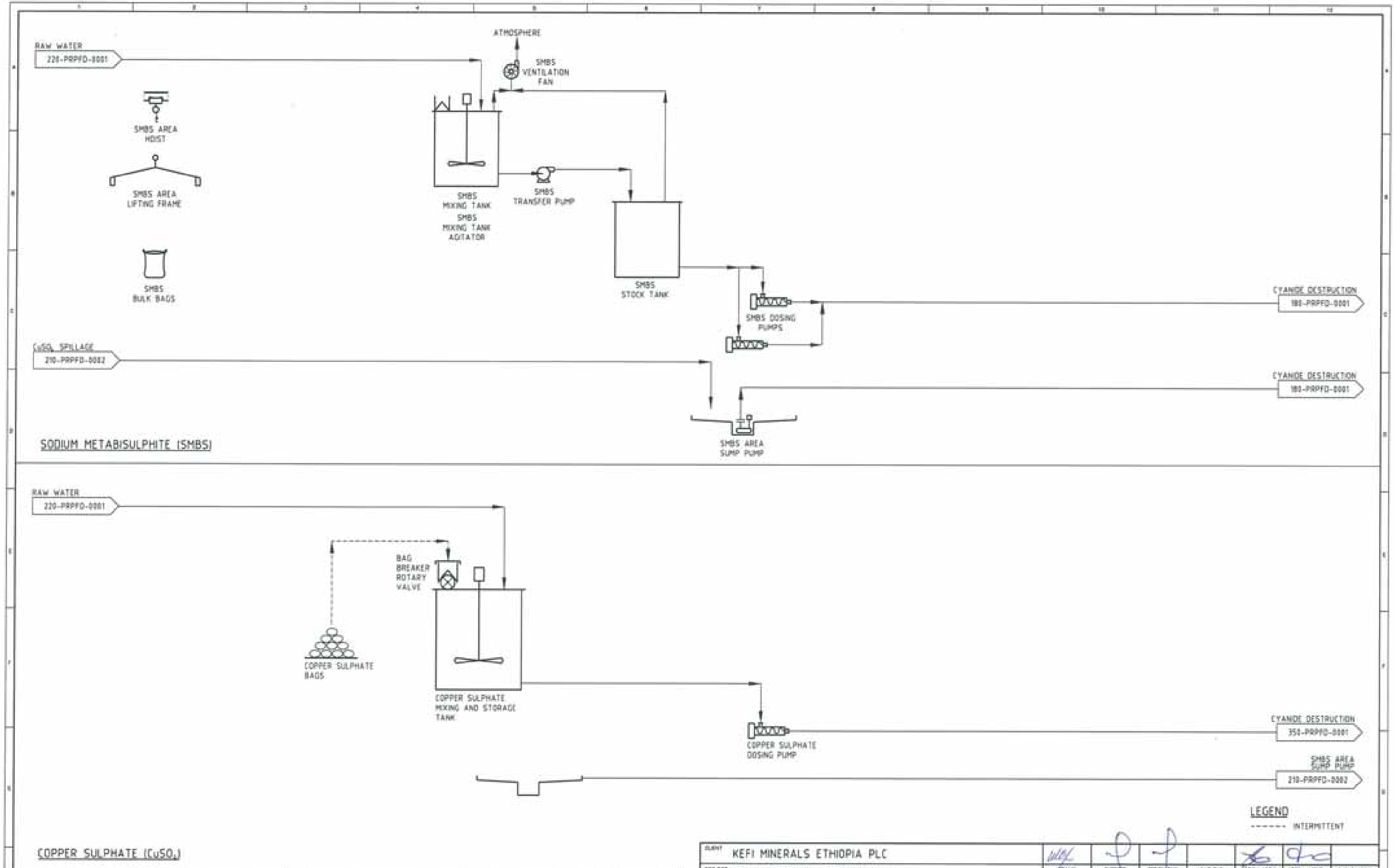

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XX	XXX	C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
		B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
		A	26JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GD		DG	BR	

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PROJECT TULU KAPI GOLD PROJECT

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DRAWING TITLE
REAGENTS
REAGENTS SHEET 2 OF 2
PROCESS FLOW DIAGRAM

DRAWN	CHECKED	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D

SCALE	JOB No	DRG No	REV
NTS	1953	210-PRPFD-0002	C

DRAWN	DATE
LO	29JUN16

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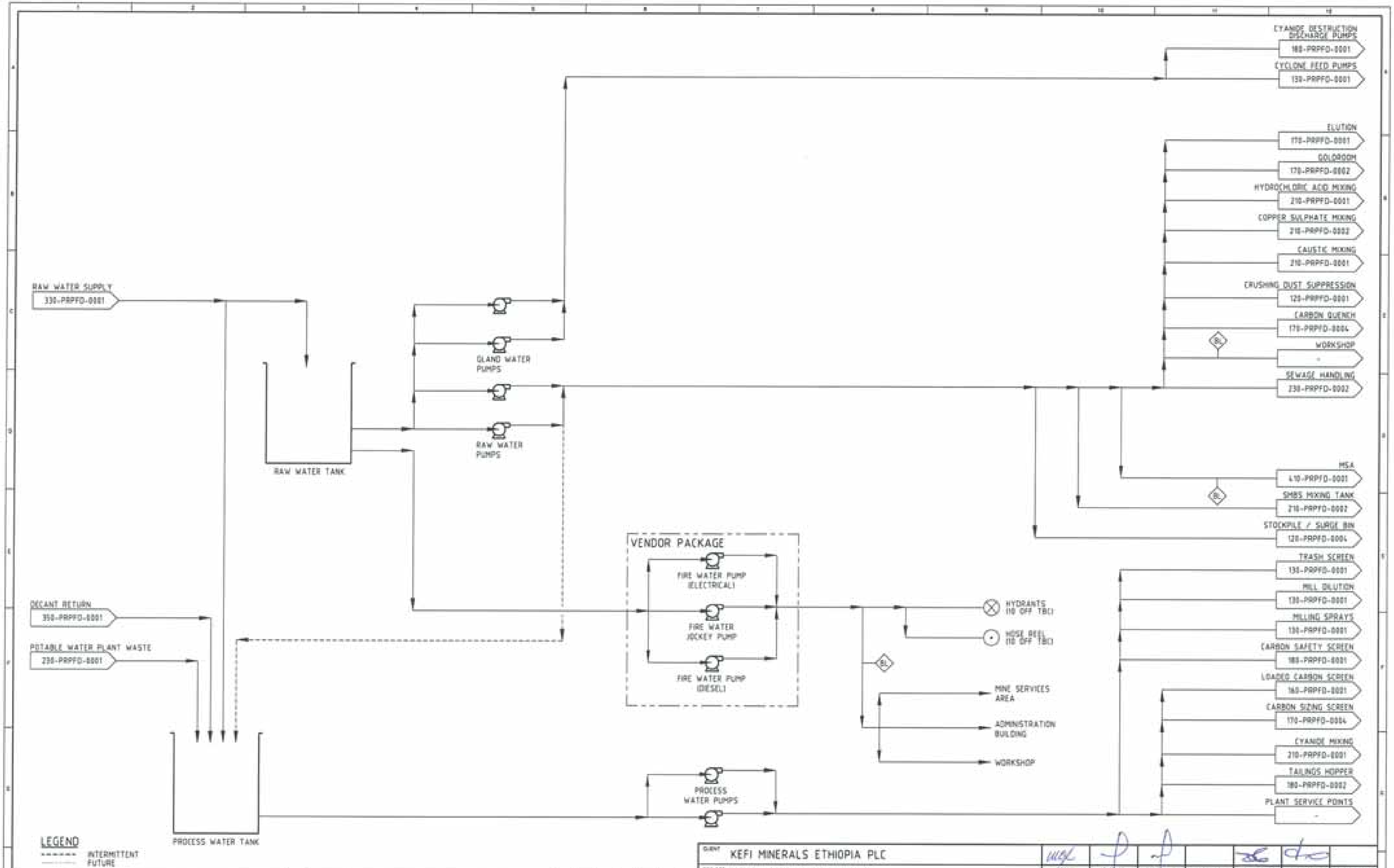

C	26OCT16	REVISED TO ALIGN WITH CONTRACT	IL	MG	MG		DG	BR		
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REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D	

DRG No	REFERENCE DRAWINGS
XX	XXX

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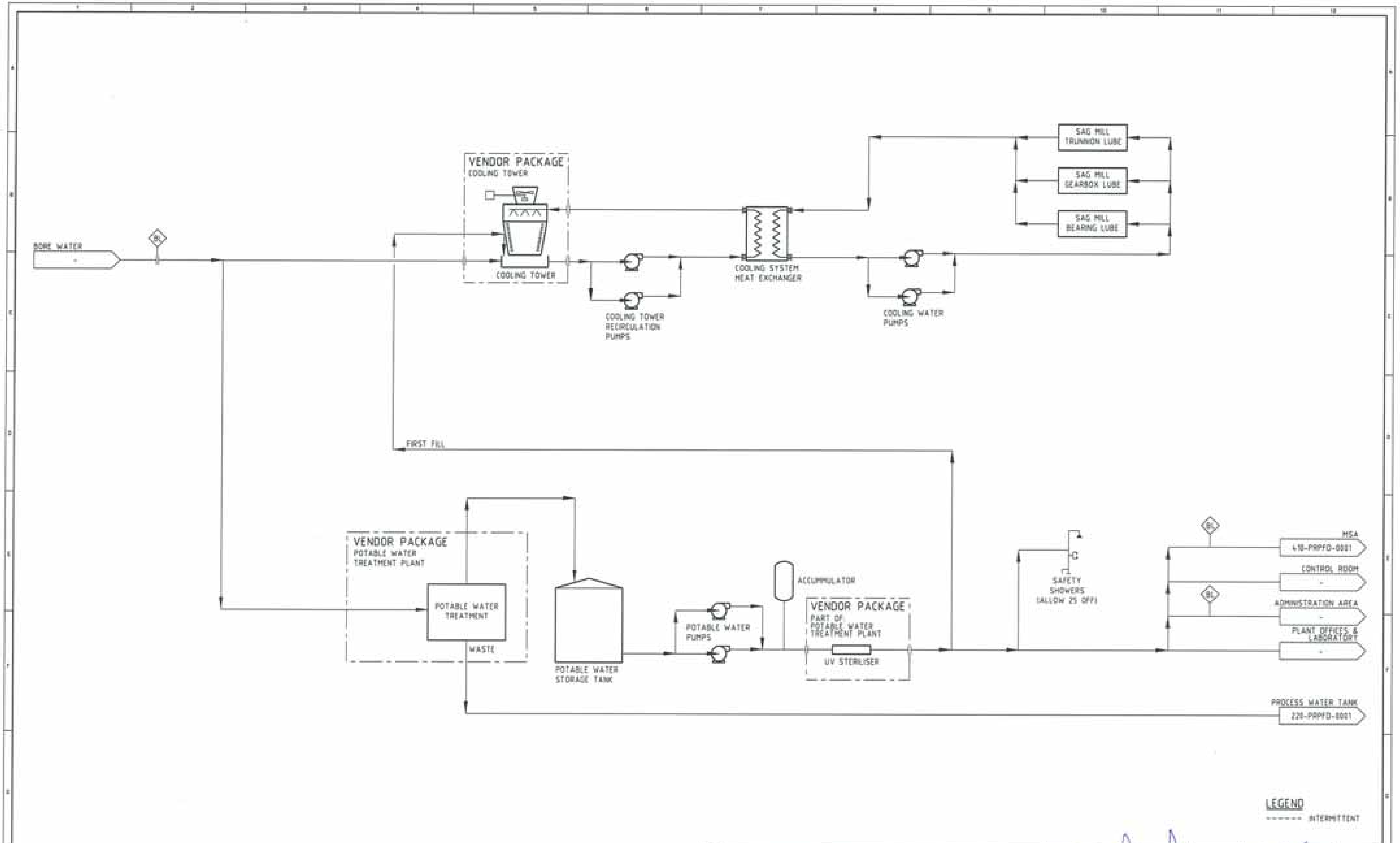
DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
WATER SERVICES
RAW, PROCESS AND FIRE WATER SERVICES
PROCESS FLOW DIAGRAM

SCALE	JOB No	DRG No	REV
NTS	1953	220-PRPFD-0001	C
DRAWN LD	DATE 29JUN16		

A1



REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	LD	HP	DG		DG	BR	

DRG No	REFERENCE DRAWINGS
XX	XXX

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DRAWING TITLE
PLANT SERVICES
TREATED WATER SERVICES
PROCESS FLOW DIAGRAM

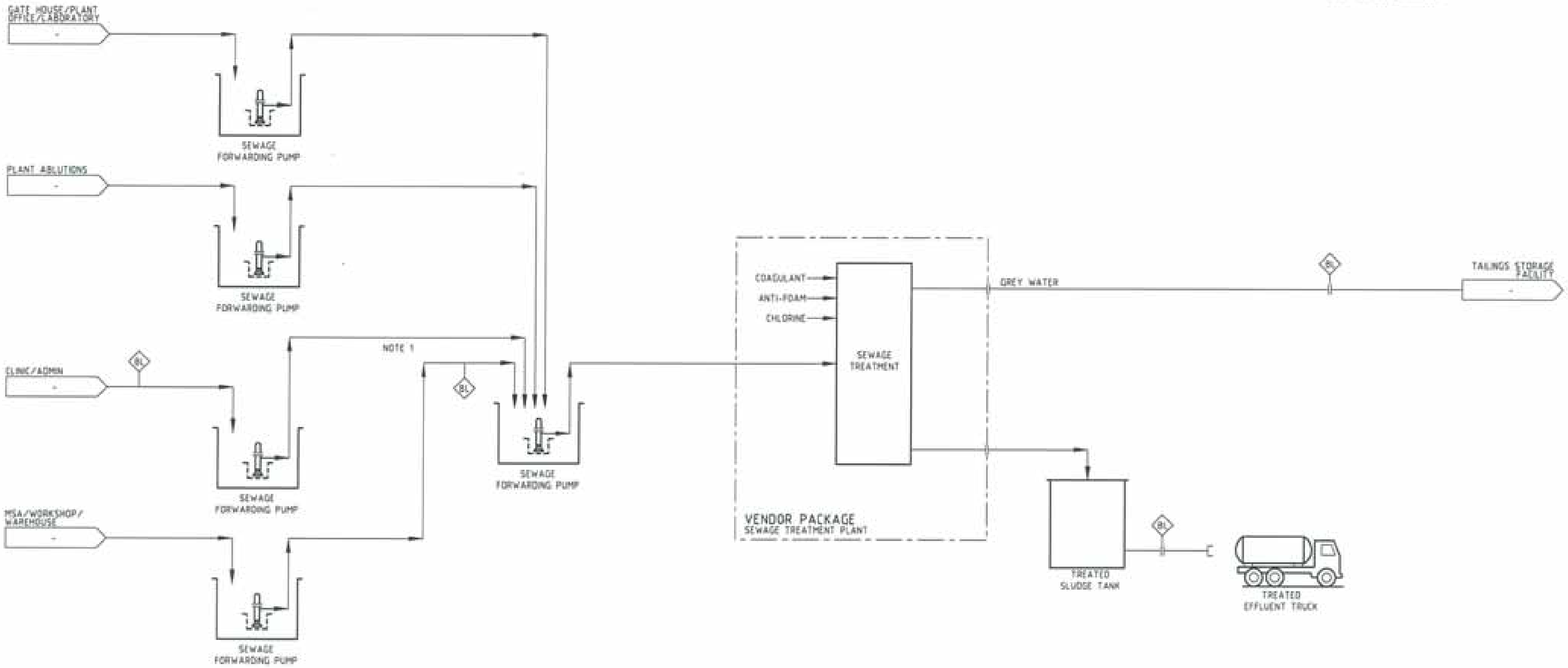
SCALE	JOB No	DRG No	REV
NTS	1953	230-PRPFD-0001	C

DRAWN LD DATE 29JUN16

A1

NOTES

1. FINAL ARRANGEMENT OF SEWAGE FORWARDING PUMPS TO BE CONFIRMED.



REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MG		DG	BR	
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	18AUG16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB		DG		DG	BR	

DRG No	REFERENCE DRAWINGS
XX	XXX

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DRAWING TITLE
PLANT SERVICES
SEWAGE HANDLING & TREATMENT
PROCESS FLOW DIAGRAM

SCALE	DRAWN	DATE	JOB No	DRG No	REV
NTS	CB	18AUG16	1953	230-PRPFD-0002	C

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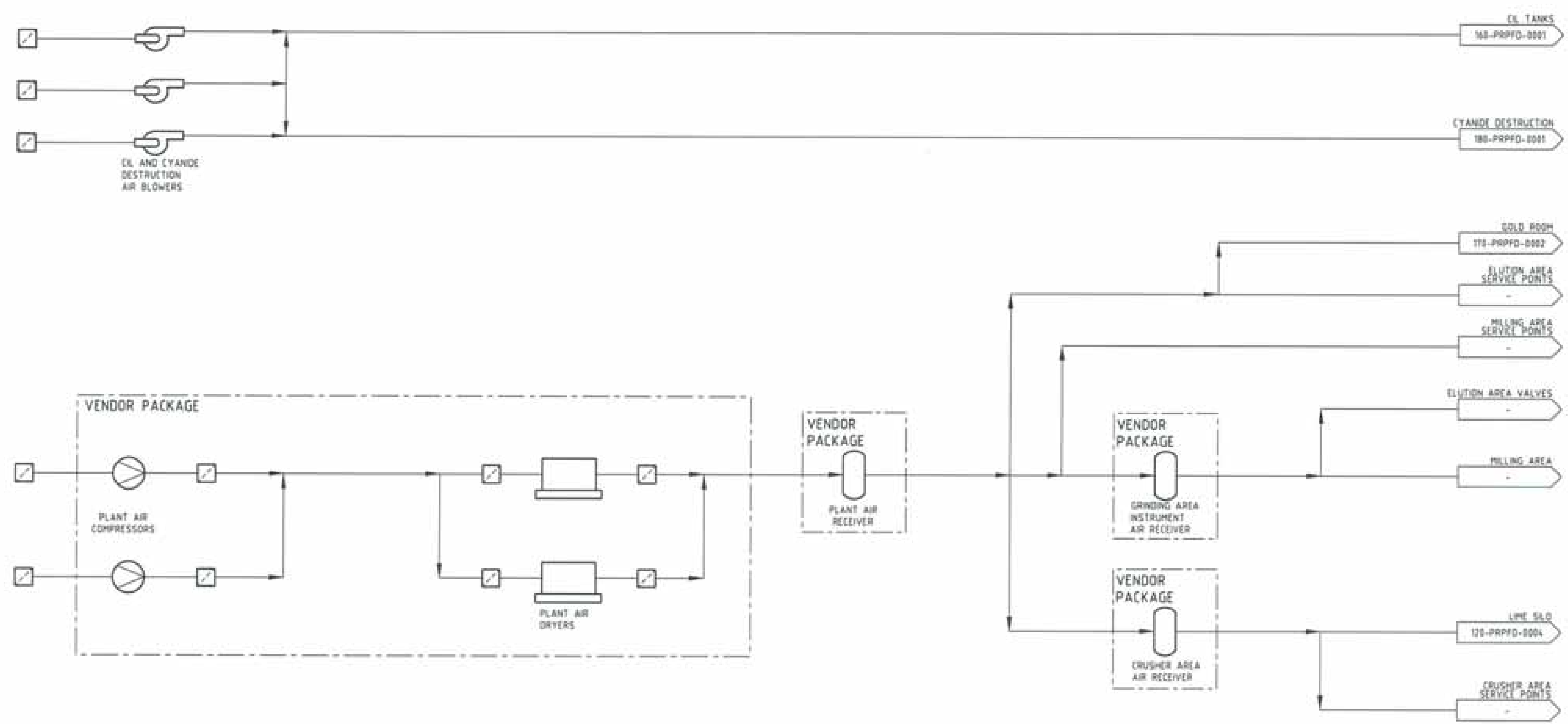

LEGEND
INTERMITTENT
FUTURE

REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D
C	28OCT16	REVISED TO ALIGN WITH CONTRACT	EL	MG	MC		DG	BR	
B	25AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	28JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	GO		DG	BR	

DRG No.	REFERENCE DRAWINGS
XX	XXX

CLIENT: KEFI MINERALS ETHIOPIA PLC
PROJECT: TULU KAPI GOLD PROJECT

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DRAWING TITLE: AIR SERVICES
AIR SERVICES
PROCESS FLOW DIAGRAM

SCALE	JOB No.	DWG No.	REV
NTS	1953	240-PRPFD-0001	C
DRAWN: LD	DATE: 29JUN16		

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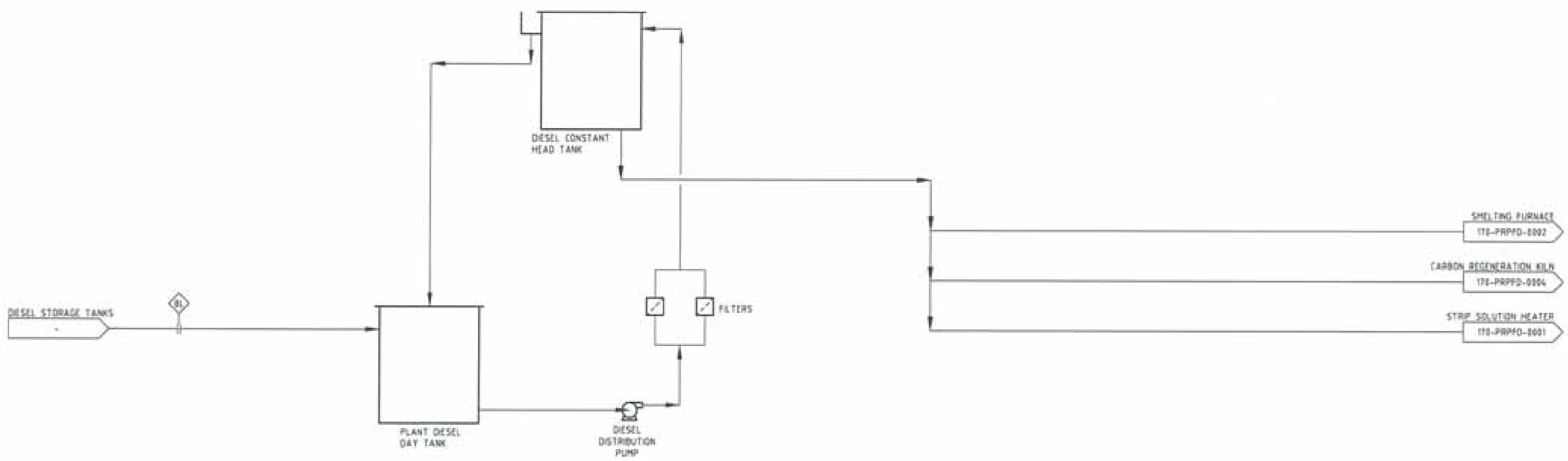
PLANT DIESEL



REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
C	28OCT16	REVISED TO ALIGN WITH CONTRACT	CL	MG	MG		DG	BR	
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	18JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DD		DG	BR	

DRG No	REFERENCE DRAWINGS
XX	XXX

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
FUELS
FUEL STORAGE & DISTRIBUTION
PROCESS FLOW DIAGRAM

SCALE	DRAWN	DATE	JOB No.	DRG No.	REV
NTS	LD	29JUN16	1953	250-PRPFD-0001	C

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LEGEND
------ INTERMITTENT

DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
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		B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
X.X	XXX	A	04JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	PP	DG		DG	BR	

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DRAWN	CHECKED	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D

DRAWING TITLE
WATER & SEWERAGE
RAW WATER SUPPLY
PROCESS FLOW DIAGRAM

SCALE NTS | JOB No 1953 | DRG No 330-PRPFD-0001 | REV C

DRAWN LD | DATE 29JUN16

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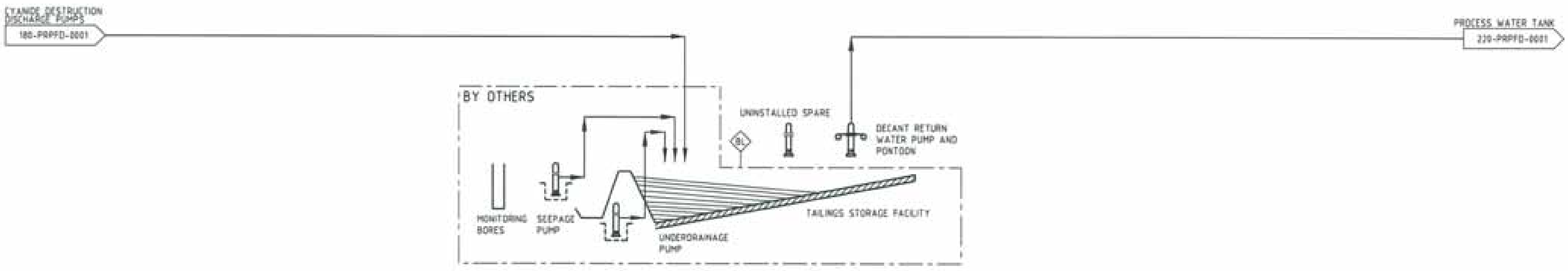

DRG No	REFERENCE DRAWINGS
XX	XXX

REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
B	23AUG16	ISSUED FOR FEED	CB		DG		DG	BR	
A	26JUL16	ISSUED FOR INTERNAL/CLIENT REVIEW	CB	MP	DG		DG	BR	

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
TAILINGS MANAGEMENT FACILITY (TMF)
TMF, DECANT RETURN AND CYANIDE DESTRUCTION
PROCESS FLOW DIAGRAM

SCALE	JOB No.	DWG No.	REV.
NTS	1953	350-PRPFD-0001	B

DRAWN LO DATE 29JUN16

A1

APPENDIX 6.4

ELECTRICAL LOAD LIST

ECG ENGINEERING

Engineering innovation & integrity in partnership

Electrical Equipment

Load List

TUL-0001-E-LL-0001

Revision: 1 Date: 9/09/16

Prepared For

KEFI Minerals Ethiopia PLC

Tulu Kapi Gold Project

Ethiopia

1953

ECG ENGINEERING

Contact Information

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Document Information

Client Information

Prepared For: KEFI Minerals Ethiopia PLC

Project Name: Tulu Kapi Gold Project

Site Location: Ethiopia
Client Reference: 1953

ECG Information

Project Manager: Brent Chadwick
Project No: TUL-0001
Discipline Code: E
Doc Type: Load List
Doc Type Code: LL
Doc No: 0001
Doc Title: Electrical Equipment

Document Control

Rev	Date	Description of Revision	Prepared By	Reviewed By	Design Approved
1	9/9/2016	Minor revision to align with MEL			
0	6/9/2016	Issued for FEED	B.Chadwick	M.Melville	B.Chadwick
A	27/7/2016	Issued for Review	B.Chadwick	M.LeCerf	M.LeCerf

Rev	Date	Description of Revision	Design Approved	Project Approved	Client Approved
1	9/09/2016	Minor revision to align with MEL			
0	6/09/2016	Issued for FEED			
A	27/07/2016	Issued for Review			

Electrical Equipment Load List
Summary

		CONNECTED LOAD	MAXIMUM DEMAND				AVERAGE DEMAND		TRANSFORMER DETAILS		
EQUIPMENT TAG	EQUIPMENT NAME	kW	MD kW	MD kVAR	MD kVA	MD PF	AV kW	MWh/year	TX SIZE (kVA)	TX LOADING (@MD)	TX TYPE
270-SB-001	MAIN 11kV SWITCHBOARD	8657	6678	1474	6838	0.98	5335	46732			
120-MC-001	FEED PREPARATION MCC	382	270	141	305	0.89	191	1670			
120-TX-001	FEED PREPARATION TRANSFORMER								500	61.01%	PAD MOUNT
130-MC-001	GRINDING / CIL MCC	1959	1108	652	1286	0.86	1000	8760			
130-TX-001	GRINDING / CIL TRANSFORMER								2000	64.28%	PAD MOUNT
210-MC-001	TAILINGS / SERVICES AREA MCC	1724	929	470	1041	0.89	824	7218			
210-TX-001	TAILINGS / SERVICES TRANSFORMER								2000	52.05%	PAD MOUNT
130-ML-001	SAG MILL DRIVE	4592	4370	1712	4693	0.93	3320	29083			
270-PF-001	POWER FACTOR CORRECTION	0	0	-1500	0		0	0			
	OVERHEAD POWERLINE	1424	1076	422	1155	0.93	948	8301			
220-MC-001	RAW WATER DAM MCC	120	96	57	111	0.86	87	766			
220-TX-001	RAW WATER DAM TRANSFORMER								250	44.57%	POLE MOUNT
350-MC-001	DECANT RETURN MCC	121	97	49	108	0.89	88	772			
350-TX-001	DECANT RETURN TRANSFORMER								250	43.39%	POLE MOUNT
350-MC-002	TSF SEEPAGE / UNDERDRAINAGE MCC	1	1	1	1	0.56	1	6			
350-TX-002	TSF SEEPAGE / UNDERDRAINAGE TRANSFORMER								50	2.86%	POLE MOUNT
360-SB-001	PLANT ENTRY INFRASTRUCTURE SWITCHBOARD	150	112	37	118	0.95	102	895			
360-TX-001	PLANT ENTRY INFRASTRUCTURE TRANSFORMER								500	23.58%	KIOSK
370-SB-001	PLANT INFRASTRUCTURE SWITCHBOARD	270	208	68	219	0.95	190	1663			
370-TX-001	PLANT INFRASTRUCTURE TRANSFORMER								500	43.79%	KIOSK
380-SB-001	ACCOMMODATION CAMP SWITCHBOARD	561	401	131	422	0.95	366	3208			
380-TX-001	ACCOMMODATION CAMP TRANSFORMER								500	84.46%	KIOSK
450-SB-001	MINE SERVICES SWITCHBOARD	182	145	70	161	0.90	102	893			
450-TX-001	MINE SERVICES TRANSFORMER								250	64.43%	POLE MOUNT
450-SB-002	EXPLOSIVES STORE SWITCHBOARD	20	16	8	18	0.90	11	98			
450-TX-002	EXPLOSIVES STORE TRANSFORMER								50	35.56%	POLE MOUNT
TOTALS		10,081	7,753	1,896	7,982	0.97	6,282	55,034			

KEFI Minerals Ethiopia PLC
Tulu Kapi Gold Project

Electrical Equipment Load List
Detailed

DRIVE DETAILS													CONNECTED LOAD					MAXIMUM DEMAND					AVERAGE					
SWITCHBOARD	WBS	EQUIPMENT ID	EQUIPMENT NO.	EQUIPMENT TAG	TOT QTY	S/BY QTY	EMERGENCY	EQUIPMENT NAME	NAME PLATE (kW)	INSTALLED (kW)	DUTY	DRIVE TYPE	EFFICIENCY	ABSORBED kW	PF	kVA	HARMONIC LOADING FACTOR	MECHANICAL LOAD FACTOR	DEMAND FACTOR	MD (kW)	MD (kVAR)	MD (kVA)	PLANT AVAILABILITY	AVERAGE (kW)	AVERAGE (kVA)	AVERAGE (MWh/year)	NOTES	REV
120-MC-001	121	FE	001	121-FE-001	1	0	0	PRIMARY APRON FEEDER	30	30	DUTY	VSD	0.97	31.0	1.00	31.1	20%	0.80	1.00	24.79	7.18	25.81	0.70	17.36	18.07	152.03		0
	121	ZM	002	121-ZM-002	1	0	0	PRIMARY APRON FEEDER AUTOMATIC LUBRICATION UNIT	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	FED FROM SWITCHROOM L&SP DB	0
120-MC-001	121	SC	002	121-SC-002	1	0	0	VIBRATING GRIZZLY	22	22	DUTY	DOL	0.94	23.5	0.74	31.7		0.80	1.00	18.78	17.07	25.38	0.70	13.15	17.77	115.18		0
120-MC-001	121	CR	001	121-CR-001	1	0	0	PRIMARY CRUSHER	160	160	DUTY	DOL	0.96	167.2	0.89	187.9		0.80	1.00	133.75	68.52	150.28	0.70	93.63	105.20	820.16		0
120-MC-001	121	ZM	003	121-ZM-003	1	0	1	PRIMARY CRUSHER HYDRAULIC POWER UNIT	2.2+1.5	3.7	DUTY	FDR	1.00	3.7	1.00	3.7		0.80	1.00	2.96	0.00	2.96	0.70	2.07	2.07	18.15		0
	121	ZM	005	121-ZM-005	1	0	0	PRIMARY CRUSHER AUTOMATIC LUBRICATION UNIT	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	FED FROM SWITCHROOM L&SP DB	0
120-MC-001	121	CN	001	121-CN-001	1	0	1	PRIMARY CRUSHER MAINTENANCE HOIST	30	30	DUTY	FDR	1.00	30.0	1.00	30.0		0.80	0.02	0.48	0.00	0.48	0.70	0.34	0.34	2.94		0
120-MC-001	121	CV	001	121-CV-001	1	0	0	PRIMARY CRUSHER DISCHARGE CONVEYOR	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	1.00	25.53	17.82	31.14	0.70	17.87	21.80	156.56		0
120-MC-001	125	CV	002	125-CV-002	1	0	0	STOCKPILE FEED CONVEYOR	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	1.00	25.53	17.82	31.14	0.70	17.87	21.80	156.56		0
130-MC-001	131	FE	001	131-FE-001	1	0	0	RECLAIM APRON FEEDER	18.5	18.5	DUTY	VSD	0.97	19.0	1.00	19.1	20%	0.80	1.00	15.20	4.22	15.77	0.91	13.87	14.39	121.48		0
	131	ZM	001	131-ZM-001	1	0	0	RECLAIM APRON FEEDER AUTOMATIC LUBRICATION UNIT	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	FED FROM SWITCHROOM L&SP DB	0
130-MC-001	131	CV	003	131-CV-003	1	0	0	MILL FEED CONVEYOR	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	1.00	25.53	17.82	31.14	0.91	23.30	28.42	204.12		0
130-MC-001	212	VB	001	212-VB-001	1	0	0	LIME SILO BIN ACTIVATOR	0.4	0.4	DUTY	DOL	-	0.4	-			0.80	1.00	0.32			0.91	0.29		2.56		0
130-MC-001	212	ZM	001	212-ZM-001	1	0	0	LIME SILO ROTARY VALVE	0.37	0.37	DUTY	VSD	0.95	0.4	1.00	0.4	20%	0.80	1.00	0.31	0.09	0.33	0.91	0.29	0.30	2.50		0
130-MC-001	212	FN	001	212-FN-001	1	0	0	LIME SILO ROTARY VALVE COOLING FAN	0.37	0.37	DUTY	DOL	0.74	0.5	0.56	0.9		0.80	1.00	0.40	0.59	0.72	0.91	0.37	0.65	3.20		0
130-MC-001	212	CN	001	212-CN-001	1	0	1	LIME HOIST	6	6	DUTY	FDR	1.00	6.0	1.00	6.0		0.80	0.02	0.10	0.00	0.10	0.91	0.09	0.09	0.77		0
130-MC-001	212	DC	001	212-DC-001	1	0	1	LIME SILO DUST COLLECTOR	5.5	5.5	DUTY	FDR	1.00	5.5	1.00	5.5		0.80	1.00	4.40	0.00	4.40	0.91	4.02	4.02	35.18		0
130-ML-001	132	ZM	002	132-ZM-002	1	0	0	SAG MILL MOTOR	4500	4500	DUTY	VSD	0.98	4591.8	0.96	4783.2	10%	0.95	1.00	4370.00	1711.58	4693.23	0.91	3320.00	3458.33	29083.20		0
130-MC-001	130	MC	002	130-MC-002	1	0	0	SAG MILL FIELD MCC	274.65	274.65	DUTY	FDR	0.94	293.6	0.80	368.76		0.61	1.00	178.59	132.72	223.65	0.91	162.98	204.11	1427.73		0
INCL	132	ZM	014	132-ZM-014	1	0	0	SAG MILL MOTOR SPACE HEATER	0.75	0.75	DUTY	DOL	0.82	0.9	0.64	1.4		0.80	1.00	0.74	0.88	1.15	0.91	0.67	1.05	5.89		0
INCL	132	PP	001	132-PP-001	1	0	0	SAG MILL MOTOR BEARING LUBRICATION PUMP 1	2.2	2.2	DUTY	DOL	0.88	2.5	0.74	3.4		0.80	1.00	2.01	1.80	2.70	0.91	1.83	2.46	16.04		0
INCL	132	PP	002	132-PP-002	1	1	0	SAG MILL MOTOR BEARING LUBRICATION PUMP 2	2.2	2.2	STDBY	DOL	0.88	2.5	0.74	3.4		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
INCL	132	ZM	004	132-ZM-004	4	0	0	SAG MILL GEARBOX LUBRICATION IMMERSION BAR HEATER	1.5	1.5	DUTY	DOL	0.87	6.9	0.66	10.4		0.80	1.00	5.51	6.27	8.35	0.91	5.03	7.62	44.06		0
INCL	132	ZM	005	132-ZM-005	1	0	0	SAG MILL INCHING DRIVE	90	90	DUTY	DOL	0.96	94.2	0.85	110.9		0.80	1.00	75.39	46.72	88.70	0.91	68.80	80.95	602.73		0
INCL	132	PP	003	132-PP-003	1	0	0	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 1	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	1.00	25.53	17.82	31.14	0.91	23.30	28.42	204.12		0
INCL	132	PP	004	132-PP-004	1	0	0	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 2	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
INCL	132	PP	005	132-PP-005	1	1	0	SAG MILL TRUNNION BEARING LUBRICATION OIL PUMP 3	30	30	STDBY	DOL	0.94	31.9	0.82	38.9		0.80	1.00	25.53	17.82	31.14	0.91	23.30	28.42	204.12		0
INCL	132	PP	006	132-PP-006	1	0	0	SAG MILL TRUNNION BEARING LUBRICATION OIL RECIRCULATION PUMP 1	15	15	DUTY	DOL	0.93	16.2	0.76	21.3		0.80	1.00	12.94	11.07	17.03	0.91	11.81	15.54	103.49		0
INCL	132	PP	007	132-PP-007	1	1	0	SAG MILL TRUNNION BEARING LUBRICATION OIL RECIRCULATION PUMP 2	15	15	STDBY	DOL	0.93	16.2	0.76	21.3		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
INCL	132	ZM	007	132-ZM-007	5	0	0	SAG MILL TRUNNION BEARING LUBRICATION IMMERSION BAR HEATER	1.5	1.5	DUTY	DOL	0.87	8.6	0.66	13.0		0.80	1.00	6.89	7.84	10.44	0.91	6.29	9.53	55.07		0
INCL	132	PP	008	132-PP-008	1	0	0	SAG MILL REDUCER/ PINION BEARING LUBRICATION PUMP 1	18.5	18.5	DUTY	DOL	0.94	19.7	0.77	25.6		0.80	1.00	15.78	13.07	20.49	0.91	14.40	18.70	126.14		0
INCL	132	PP	009	132-PP-009	1	1	0	SAG MILL REDUCER/ PINION BEARING LUBRICATION PUMP 2	18.5	18.5	STDBY	DOL	0.94	19.7	0.77	25.6		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
INCL	132	ZM	009	132-ZM-009	6	0	0	SAG MILL PINION BEARING LUBRICATION IMMERSION BAR HEATER	1.5	1.5	DUTY	DOL	0.87	10.3	0.66	15.7		0.80	1.00	8.27	9.41	12.52	0.91	7.54	11.43	66.09		0
130-MC-001	132	ZM	010	132-ZM-010	1	0	1	SAG MILL LINER HANDLER	30	30	DUTY	FDR	1.00	30.0	1.00	30.0		0.80	1.00	24.00	0.00	24.00	0.91	21.90	21.90	191.87		0
130-MC-001	132	PP	010	132-PP-010	1	0	1	MILLING AREA SUMP PUMP	30	30	DUTY	DOL	0.94	31.9	0.82	38.9		0.80	0.10	2.55	1.78	3.11	0.91	2.33	2.84	20.41		0
130-MC-001	133	PP	001	133-PP-001	1	0	0	CYCLONE FEED PUMP 1	250	250	DUTY	VSD	0.98	255.9	1.00	256.4	20%	0.80	1.00	204.71	53.91	211.69	0.91	186.82	193.19	1636.55		0
130-MC-001	133	PP	002	133-PP-002	1	1	0	CYCLONE FEED PUMP 2	250	250	STDBY	VSD	0.98	255.9	1.00	256.4	20%	0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
130-MC-001	133	CN	001	133-CN-001	1	0	1	CYCLONE AREA DAVIT CRANE	5.5	5.5	DUTY	FDR	1.00	5.5	1.00	5.5		0.80	0.02	0.09	0.00	0.09	0.91	0.08	0.08	0.70		0
130-MC-001	141	SC	001	141-SC-001	1	0	0	TRASH SCREEN	2 x 9	22	DUTY	DOL	0.92	23.9	0.77	31.1		0.80	1.00	19.13	15.85	24.84	0.91	17.46	22.67	152.94		0
130-MC-001	162	AG	001	162-AG-001	1	0	1	CIL TANK 1 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	001	162-SC-001	1	0	0	CIL TANK 1 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	001	162-PP-001	1	0	0	CIL TANK 1 CARBON RECOVERY PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	AG	002	162-AG-002	1	0	1	CIL TANK 2 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	002	162-SC-002	1	0	0	CIL TANK 2 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	002	162-PP-002	1	0	0	CIL TANK 2 CARBON RECOVERY PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	AG	003	162-AG-003	1	0	1	CIL TANK 3 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	003	162-SC-003	1	0	0	CIL TANK 3 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	003	162-PP-003	1	0	0	CIL TANK 3 CARBON ADVANCE PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	AG	004	162-AG-004	1	0	1	CIL TANK 4 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	004	162-SC-004	1	0	0	CIL TANK 4 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	004	162-PP-004	1	0	0	CIL TANK 4 CARBON ADVANCE PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	AG	005	162-AG-005	1	0	1	CIL TANK 5 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	005	162-SC-005	1	0	0	CIL TANK 5 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	005	162-PP-005	1	0	0	CIL TANK 5 CARBON ADVANCE PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	AG	006	162-AG-006	1	0	1	CIL TANK 6 AGITATOR	75	75	DUTY	DOL	0.96	78.2	0.80	97.8		0.80	1.00	62.57	46.92	78.21	0.91	57.10	71.37	500.18		0
130-MC-001	162	SC	006	162-SC-006	1	0	0	CIL TANK 6 INTERTANK SCREEN	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	162	PP	006	162-PP-006	1	0	0	CIL TANK 6 CARBON ADVANCE PUMP	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
130-MC-001	162	CN	001	162-CN-001	1	0	1	CIL AREA SERVICE CRANE	34.6	34.6	DUTY	FDR	1.00	34.6	1.00	34.6		0.80	0.02	0.55	0.00	0.55	0.91	0.51	0.51	4.43		0
130-MC-001	162	PP	007	162-PP-007	1	0	1	CIL AREA SUMP PUMP 1	15	15	DUTY	DOL	0.93	16.2	0.76	21.3		0.80	0.10	1.29	1.11	1.70	0.91	1.18	1.55	10.35		0
130-MC-001	162	PP	008	162-PP-008	1	0	1	CIL AREA SUMP PUMP 2	15	15	DUTY	DOL	0.93	16.2	0.76	21.3		0.80	0.10	1.29	1.11	1.70	0.91	1.18	1.55	10.35		0
130-MC-001	171	SC	001	171-SC-001	1	0	0	LOADED CARBON RECOVERY SCREEN	2 x 1.1	2.2	DUTY	DOL	0.86	2.6	0.69	3.7		0.80	1.00	2.05	2.15	2.97	0.91	1.87	2.71	16.36		0
	173	HX	001	173-HX-001	1	0	0	STRIP SOLUTION HEATER	1.5		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
130-MC-001	173	PP	001	173-PP-001	1	0	0	THERMAL OIL CIRCULATION PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	1.00	6.56	6.14	8.98	0.91	5.98	8.20	52.42		0
130-MC-001	173	PP	002	173-PP-002	1	0	0	SULPHAMIC ACID PUMP	2.2	2.2	DUTY	DOL	0.88	2.5	0.74	3.4		0.80	1.00	2.01	1.80	2.70	0.91	1.83	2.46	16.04		0
130-MC-001	173	PP	003	173-PP-003	1	0	0	STRIPPING SOLUTION PUMP	22	22	DUTY	VSD	0.97	22.7	1.00	22.8	20%	0.80	1.00	18.18	5.46	18.98	0.91	16.59	17.33	145.35		0
130-MC-001	173	PP	004	173-PP-004	1	0	0	STRIPPING WATER ANTISCALANT PUMP	0.1	0.1	DUTY	DOL	-	0.1	-			0.80	1.00	0.08			0.91	0.07		0.64		0
130-MC-001	173	PP	005	173-PP-005	1	0	1	ELUTION SUMP PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	0.10	0.66	0.61	0.90	0.91	0.60	0.82	5.24		0
130-MC-001	174	SC	001	174-SC-001	1	0	0	CARBON DEWATERING SCREEN	2.2	2.2	DUTY	DOL	0.88	2.5	0.74	3.4		0.80	1.00	2.01	1.80	2.70	0.91	1.83	2.46	16.04		0
130-MC-001	174	KN	001	174-KN-001	1	0	1	CARBON REGENERATION KILN	3.8	3.8	DUTY	FDR	1.00	3.8	1.00	3.8		0.80	1.00	3.04	0.00	3.04	0.91	2.77	2.77	24.30		0
130-MC-001	176	RC	001	176-RC-001	1	0	1	ELECTROWINNING CELL 1 RECTIFIER	35	35	DUTY	FDR	0.95	36.8	0.90	40.9	20%	0.80	1.00	29.47	20.17	35.71	0.91	26.90	32.59	235.63		0
130-MC-001	176	RC	002	176-RC-002	1	0	1	ELECTROWINNING CELL 2 RECTIFIER	35	35	DUTY	FDR	0.95	36.8	0.90	40.9	20%	0.80	1.00	29.47	20.17	35.71	0.91	26.90	32.59	235.63		0
	176	FA	001	176-FA-001	1	0	0	ELECTROWINNING CELL FUME EXTRACTION FAN	2.2		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
	176	ZM	006	176-ZM-006	1	1	0	CATHODE HIGH PRESSURE WASH SPRAY MACHINE	2.2		STDBY	FDR	1.00	0.0	1.00	0.0		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
130-MC-001	177	CN	001	177-CN-001	1	0	1	GOLD ROOM CRANE	6.74	6.74	DUTY	FDR	1.00	6.7	1.00	6.7		0.80	0.02	0.11	0.00	0.11	0.91	0.10	0.10	0.86		0
	177	FA	001	177-FA-001	1	0	0	GOLDROOM ROOF FAN 1	1.5		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
	177	FA	002	177-FA-002	1	0	0	GOLDROOM ROOF FAN 2	1.5		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
	177	FA	003	177-FA-003	1	0	0	GOLDROOM ROOF FAN 3	1.5		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
	177	FA	004	177-FA-004	1	0	0	GOLDROOM ROOF FAN 4	1.5		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
130-MC-001	177	PP	001	177-PP-001	1	0	0	PAN FILTER VACUUM PUMP	4	4	DUTY	DOL	0.89	4.5	0.85	5.3		0.80	1.00	3.62	2.24	4.25	0.91	3.30	3.88	28.91		0
130-MC-001	177	PP	002	177-PP-002	1	0	1	GOLD ROOM SUMP PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	0.10	0.66	0.61	0.90	0.91	0.60	0.82	5.24		0
130-MC-001	177	DR	001	177-DR-001	1	0	0	DRYING OVEN	24	24	DUTY	FDR	1.00	24.0	1.00	24.0		0.80	1.00	19.20	0.00	19.20	0.91	17.52	17.52	153.49		0
	177	FC	001	177-FC-001	1	0	0	BARRING FURNACE	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
	177	FA	005	177-FA-005	1	0	0	FURNACE EXTRACTION FAN	2.2		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM GOLD ROOM L&SP DB	0
210-MC-001	181	SC	001	181-SC-001	1	0	0	CARBON SAFETY SCREEN	2 x 7.5	15	DUTY	DOL	0.92	16.3	0.73	22.3		0.80	1.00	13.04	12.21	17.87	0.91	11.90	16.31	104.28		0
210-MC-001	183	AG	001	183-AG-001	1	0	1	CYANIDE DESTRUCTION TANK 1 AGITATOR	55	55	DUTY	DOL	0.94	58.4	0.79	73.9		0.80	1.00	46.71	36.25	59.13	0.91	42.63	53.96	373.42		0
210-MC-001	183	AG	002	183-AG-002	1	0	1	CYANIDE DESTRUCTION TANK 2 AGITATOR	55	55	DUTY	DOL	0.94	58.4	0.79	73.9		0.80	1.00	46.71	36.25	59.13	0.91	42.63	53.96	373.42		0
210-MC-001	183	PP	001	183-PP-001	1	0	1	CYANIDE DESTRUCTION SUMP PUMP	15	15	DUTY	DOL	0.93	16.2	0.76	21.3		0.80	0.10	1.29	1.11	1.70	0.91	1.18	1.55	10.35		0
210-MC-001	183	PP	002	183-PP-002	1	0	0	CYANIDE DESTRUCTION DISCHARGE PUMP 1	90	90	DUTY	VSD	0.97	92.4	1.00	92.5		0.80	1.00	73.92	3.31	74.00	0.91	67.46	67.53	590.97		0
210-MC-001	183	PP	003	183-PP-003	1	1	0	CYANIDE DESTRUCTION DISCHARGE PUMP 2	90	90	STDBY	VSD	0.97	92.4	1.00	92.5		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0

KEFI Minerals Ethiopia PLC
Tulu Kapi Gold Project

Electrical Equipment Load List
Detailed

DRIVE DETAILS														CONNECTED LOAD				MAXIMUM DEMAND					AVERAGE					
SWITCHBOARD	WBS	EQUIPMENT ID	EQUIPMENT NO.	EQUIPMENT TAG	TOT QTY	S/BY QTY	EMERGENCY	EQUIPMENT NAME	NAME PLATE (kW)	INSTALLED (kW)	DUTY	DRIVE TYPE	EFFICIENCY	ABSORBED kW	PF	kVA	HARMONIC LOADING FACTOR	MECHANICAL LOAD FACTOR	DEMAND FACTOR	MD (kW)	MD (kVAR)	MD (kVA)	PLANT AVAILABILITY	AVERAGE (kW)	AVERAGE (kVA)	AVERAGE (MWh/year)	NOTES	REV
210-MC-001	211	CN	001	211-CN-001	1	0	1	CYANIDE HOIST	5.64	5.64	DUTY	FDR	1.00	5.6	1.00	5.6		0.80	0.02	0.09	0.00	0.09	0.91	0.08	0.08	0.72		0
210-MC-001	211	AG	001	211-AG-001	1	0	1	CYANIDE MIXING TANK AGITATOR	1.1	1.1	DUTY	DOL	0.86	1.3	0.69	1.9		0.80	1.00	1.03	1.08	1.49	0.91	0.94	1.36	8.23		0
210-MC-001	211	PP	001	211-PP-001	1	0	0	CYANIDE TRANSFER PUMP	1.1	1.1	DUTY	DOL	0.86	1.3	0.69	1.9		0.80	1.00	1.03	1.08	1.49	0.91	0.94	1.36	8.23		0
210-MC-001	211	PP	002	211-PP-002	1	0	0	CYANIDE RECIRCULATION PUMP 1	1.5	1.5	DUTY	DOL	0.87	1.7	0.66	2.6		0.80	1.00	1.38	1.57	2.09	0.91	1.26	1.91	11.01		0
210-MC-001	211	PP	003	211-PP-003	1	1	0	CYANIDE RECIRCULATION PUMP 2	1.5	1.5	STDBY	DOL	0.87	1.7	0.66	2.6		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
210-MC-001	211	PP	004	211-PP-004	1	0	0	CYANIDE DOSING PUMP	0.55	0.55	DUTY	DOL	0.79	0.7	0.62	1.1		0.80	1.00	0.55	0.70	0.89	0.91	0.51	0.82	4.43		0
210-MC-001	211	PP	005	211-PP-005	1	0	1	CYANIDE AREA SUMP PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	0.10	0.66	0.61	0.90	0.91	0.60	0.82	5.24		0
210-MC-001	214	AG	001	214-AG-001	1	0	1	CAUSTIC MIXING AGITATOR	1.1	1.1	DUTY	DOL	0.86	1.3	0.69	1.9		0.80	1.00	1.03	1.08	1.49	0.91	0.94	1.36	8.23		0
210-MC-001	214	PP	004	214-PP-004	1	0	0	ELUTION CAUSTIC DOSING PUMP	3	3	DUTY	DOL	0.88	3.4	0.74	4.6		0.80	1.00	2.73	2.48	3.69	0.91	2.49	3.37	21.85		0
210-MC-001	214	PP	005	214-PP-005	1	0	0	CYANIDE DESTRUCTION CAUSTIC DOSING PUMP	0.55	0.55	DUTY	VSD	-	0.6	-		20%	0.80	1.00	0.44			0.91	0.40		3.52		0
210-MC-001	214	PP	001	214-PP-001	1	0	0	HYDROCHLORIC ACID DRUM PUMP	2.2	2.2	DUTY	DOL	0.88	2.5	0.74	3.4		0.80	1.00	2.01	1.80	2.70	0.91	1.83	2.46	16.04		0
210-MC-001	214	PP	002	214-PP-002	1	0	0	HYDROCHLORIC ACID PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	1.00	6.56	6.14	8.98	0.91	5.98	8.20	52.42		0
210-MC-001	214	PP	003	214-PP-003	1	0	1	ACID AREA SUMP PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	0.10	0.66	0.61	0.90	0.91	0.60	0.82	5.24		0
210-MC-001	216	CN	001	216-CN-001	1	0	1	SMBS HOIST	5.64	5.64	DUTY	FDR	1.00	5.6	1.00	5.6		0.80	0.02	0.09	0.00	0.09	0.91	0.08	0.08	0.72		0
210-MC-001	216	AG	001	216-AG-001	1	0	1	SMBS MIXING TANK AGITATOR	1.1	1.1	DUTY	DOL	0.86	1.3	0.69	1.9		0.80	1.00	1.03	1.08	1.49	0.91	0.94	1.36	8.23		0
210-MC-001	216	PP	001	216-PP-001	1	0	0	SMBS TRANSFER PUMP	1.5	1.5	DUTY	DOL	0.87	1.7	0.66	2.6		0.80	1.00	1.38	1.57	2.09	0.91	1.26	1.91	11.01		0
210-MC-001	216	FA	001	216-FA-001	1	0	0	SMBS TANKS VENTILATION FAN	0.75	0.75	DUTY	DOL	0.82	0.9	0.64	1.4		0.80	1.00	0.74	0.88	1.15	0.91	0.67	1.05	5.89		0
210-MC-001	216	PP	002	216-PP-002	1	0	0	SMBS DOSING PUMP 1	0.55	0.55	DUTY	VSD	-	0.6	-		20%	0.80	1.00	0.44			0.91	0.40		3.52		0
210-MC-001	216	PP	003	216-PP-003	1	1	0	SMBS DOSING PUMP 2	0.55	0.55	STDBY	VSD	-	0.6	-		20%	0.80	0.00	0.00			0.91	0.00		0.00		0
210-MC-001	216	PP	004	216-PP-004	1	0	1	SMBS AREA SUMP PUMP	7.5	7.5	DUTY	DOL	0.92	8.2	0.73	11.2		0.80	0.10	0.66	0.61	0.90	0.91	0.60	0.82	5.24		0
210-MC-001	219	ZM	002	219-ZM-002	1	0	0	COPPER SULPHATE ROTARY VALVE	0.37	0.37	DUTY	VSD	0.95	0.4	1.00	0.4	20%	0.80	1.00	0.31	0.09	0.33	0.91	0.29	0.30	2.50		0
210-MC-001	219	FN	001	219-FN-001	1	0	0	COPPER SULPHATE ROTARY VALVE COOLING FAN	0.37	0.37	DUTY	DOL	0.74	0.5	0.56	0.9		0.80	1.00	0.40	0.59	0.72	0.91	0.37	0.65	3.20		0
210-MC-001	219	AG	001	219-AG-001	1	0	1	COPPER SULPHATE MIXING TANK AGITATOR	0.75	0.75	DUTY	DOL	0.82	0.9	0.64	1.4		0.80	1.00	0.74	0.88	1.15	0.91	0.67	1.05	5.89		0
210-MC-001	219	PP	001	219-PP-001	1	0	0	COPPER SULPHATE DOSING PUMP 1	0.55	0.55	DUTY	VSD	-	0.6	-		20%	0.80	1.00	0.44			0.91	0.40		3.52		0
210-MC-001	222	PP	004	222-PP-004	1	0	1	RAW WATER PUMP 1	55	55	DUTY	DOL	0.94	58.4	0.79	73.9		0.80	1.00	46.71	36.25	59.13	0.91	42.63	53.96	373.42		0
210-MC-001	222	PP	005	222-PP-005	1	0	0	RAW WATER PUMP 2	55	55	DUTY	DOL	0.94	58.4	0.79	73.9		0.80	1.00	46.71	36.25	59.13	0.91	42.63	53.96	373.42		0
210-MC-001	223	PP	001	223-PP-001	1	0	1	PROCESS WATER PUMP 1	110	110	DUTY	DOL	0.95	115.4	0.89	129.7		0.80	1.00	92.34	47.31	103.75	0.91	84.27	94.69	738.21		0
210-MC-001	223	PP	002	223-PP-002	1	1	0	PROCESS WATER PUMP 2	110	110	STDBY	DOL	0.95	115.4	0.89	129.7		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
	228	PP	001	228-PP-001	1	0	0	FIRE WATER JOCKEY PUMP / DIESEL PUMP CONTROLLER	1.1		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM REAGENTS / SERVICE L&SP	0
210-MC-001	228	PP	002	228-PP-002	1	0	1	FIRE WATER PUMP (ELECTRIC)	90	90	DUTY	DOL	0.96	94.2	0.85	110.9		0.80	1.00	75.39	46.72	88.70	0.91	68.80	80.95	602.73		0
210-MC-001	232	ZM	001	232-ZM-001	1	0	1	WATER TREATMENT PLANT	10+0.1	10.1	DUTY	FDR	1.00	10.1	1.00	10.1		0.80	1.00	8.08	0.00	8.08	0.91	7.37	7.37	64.60		0
210-MC-001	224	PP	001	224-PP-001	1	0	0	PLANT POTABLE WATER PUMP 1	2.2	2.2	DUTY	DOL	0.88	2.5	0.74	3.4		0.80	1.00	2.01	1.80	2.70	0.91	1.83	2.46	16.04		0
210-MC-001	224	PP	002	224-PP-002	1	1	0	PLANT POTABLE WATER PUMP 2	2.2	2.2	STDBY	DOL	0.88	2.5	0.74	3.4		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
210-MC-001	225	PP	001	225-PP-001	1	0	1	GLAND WATER PUMP 1	5.5	5.5	DUTY	DOL	0.91	6.1	0.79	7.7		0.80	1.00	4.85	3.76	6.14	0.91	4.43	5.60	38.78		0
210-MC-001	225	PP	002	225-PP-002	1	1	0	GLAND WATER PUMP 2	5.5	5.5	STDBY	DOL	0.91	6.1	0.79	7.7		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
210-MC-001	226	HX	001	226-HX-001	1	0	1	COOLING TOWER	11+15+15	26	DUTY	FDR	1.00	26.0	1.00	26.0		0.80	1.00	20.80	0.00	20.80	0.91	18.98	18.98	166.29		0
INCL	226	PP	001	226-PP-001	1	0	0	COOLING TOWER RECIRCULATION PUMP 1	15	15	DUTY	DOL	0.93	16.2	0.76	21.3		0.80	1.00	12.94	11.07	17.03	0.91	11.81	15.54	103.49		0
INCL	226	PP	002	226-PP-002	1	1	0	COOLING TOWER RECIRCULATION PUMP 2	15	15	STDBY	DOL	0.93	16.2	0.76	21.3		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
210-MC-001	226	PP	003	226-PP-003	1	0	1	COOLING WATER PUMP 1	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
210-MC-001	226	PP	004	226-PP-004	1	0	0	COOLING WATER PUMP 2	11	11	DUTY	DOL	0.92	11.9	0.77	15.5		0.80	1.00	9.52	7.89	12.37	0.91	8.69	11.29	76.14		0
	226	PP	005	226-PP-005	1	0	0	COOLING WATER BIOCIDE DOSING PUMP	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM REAGENTS / SERVICE L&SP	0
	226	PP	006	226-PP-006	1	0	0	COOLING WATER ANTISCALANT DOSING PUMP	0.55		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM REAGENTS / SERVICE L&SP	0
210-MC-001	233	PP	001	233-PP-001	1	0	1	SEWAGE MACERATOR PUMP STATION 1	1.5	1.5	DUTY	FDR	1.00	1.5	1.00	1.5		0.80	1.00	1.20	0.00	1.20	0.91	1.10	1.10	9.59		0
350-SB-001	233	PP	002	233-PP-002	1	0	1	SEWAGE MACERATOR PUMP STATION 2	1.5	1.5	DUTY	FDR	1.00	1.5	1.00	1.5		0.80	1.00	1.20	0.00	1.20	0.91	1.10	1.10	9.59		0
210-MC-001	233	ZM	001	233-ZM-001	1	0	1	SEWAGE TREATMENT PLANT	11	11	DUTY	FDR	1.00	11.0	1.00	11.0		0.80	1.00	8.80	0.00	8.80	0.91	8.03	8.03	70.35		0
210-MC-001	241	CO	001	241-CO-001	1	0	1	PLANT AIR COMPRESSOR 1	75	75	DUTY	FDR	1.00	75.0	1.00	75.0		0.80	1.00	60.00	0.00	60.00	0.91	54.76	54.76	479.67		0
210-MC-001	241	CO	002	241-CO-002	1	1	1	PLANT AIR COMPRESSOR 2	75	75	STDBY	FDR	1.00	75.0	1.00	75.0		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
	241	DR	001	241-DR-001	1	0	0	PLANT AIR DRYER 1	2		DUTY	FDR	1.00	0.0	1.00	0.0		0.80	1.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM REAGENTS / SERVICE L&SP	0
	241	DR	002	241-DR-002	1	1	0	PLANT AIR DRYER 2	2		STDBY	FDR	1.00	0.0	1.00	0.0		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	FED FROM REAGENTS / SERVICE L&SP	0
210-MC-001	242	BL	001	242-BL-001	1	0	0	CIL & CYANIDE AIR BLOWER 1	132	132	DUTY	DOL	0.96	137.9	0.86	160.4		0.80	1.00	110.34	65.47	128.31	0.91	100.70	117.10	882.15		0
210-MC-001	242	BL	002	242-BL-002	1	1	0	CIL & CYANIDE AIR BLOWER 2	132	132	STDBY	DOL	0.96	137.9	0.86	160.4		0.80	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00		0
210-MC-001	242	BL	003	242-BL-003	1	0	0	CIL & CYANIDE AIR BLOWER 3	132	132	DUTY	DOL	0.96	137.9	0.86	160.4		0.80	1.00	110.34	65.47	128.31	0.91	100.70	117.10	882.15		0
210-MC-001	251	PP	001	251-PP-001	1	0	0	PLANT DIESEL DISTRIBUTION PUMP	0.75	0.75	DUTY	DOL	0.82	0.9	0.64	1.4		0.80	1.00	0.74	0.88	1.15	0.91	0.67	1.05	5.89		0
350-MC-002	351	PP	001	351-PP-001	1	0	0	TMF UNDERDRAINAGE PUMP	0.37	0.37	DUTY	DOL	0.74	0.5	0.56	0.9		0.80	1.00	0.40	0.59	0.72	0.91	0.37	0.65	3.20		0
350-MC-002	351	PP	002	351-PP-002	1	0	0	TMF SEEPAGE PUMP	0.37	0.37	DUTY	DOL	0.74	0.5	0.56	0.9		0.80	1.00	0.40	0.59	0.72	0.91	0.37	0.65	3.20		0
350-MC-001	353	PP	001	353-PP-001	1	0	0	DECANT RETURN PUMP 1	115	115	DUTY	DOL	0.95	120.7	0.89	135.6		0.80	1.00	96.54	49.46	108.47	0.91	88.10	98.99	771.77		0
220-MC-001	222	PP	001	222-PP-001	1	0	0	RAW WATER DAM PUMP	115	115	DUTY	DOL	0.96	119.8	0.86	139.3		0.80	1.00	95.83	56.86	111.43	0.91	87.46	101.70	766.14		0
										0																		
270-PF-001	270	PF	001	270-PF-001	1	0	0	POWER FACTOR CORRECTION (1.5MVAR)	0	0	DUTY	FDR	1.00	0.0		0.0		1.00	1.00	0.00	-1500.00	0.00	1.00	0.00	0.00	0.00		0
120-MC-001	120	MC	001	120-MC-001	1	0	0	400V MOTOR CONTROL CENTRE INCOMER																				0
120-MC-001	120	DB	001	120-DB-001	1	0	1	FEED PREPARATION SWITCHROOM L&SP	40	40	DUTY	FDR	1.00	40.0	0.95	42.11		0.80	1.00	32.00	10.52	33.68	0.70	22.40	23.58	196.22		0
120-MC-001	120	UP	001	120-UP-001	1	0	1	FEED PREPARATION SWITCHROOM UPS	8	8	DUTY	FDR	1.00	8.0	0.95	8.42		0.80	1.00	6.40	2.10	6.74	0.91	5.84	6.15	51.16		0
INCL	120	DB	002	120-DB-002	1	0	0	FEED PREPARATION SWITCHROOM UPS	8																			0
120-MC-001	120	WR	001	120-WR-001	1	0	1	FEED PREPARATION 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
130-MC-001	130	MC	001	130-MC-001	1	0	0	400V MOTOR CONTROL CENTRE INCOMER																				0
130-MC-001	130	DB	001	130-DB-001	1	0	1	MILLING / CIL SWITCHROOM L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
130-MC-001	130	UP	001	130-UP-001	1	0	1	MILLING / CIL SWITCHROOM UPS	16	16	DUTY	FDR	1.00	16.0	0.95	16.84		0.80	0.20	2.56	0.84	2.69	0.91	2.34	2.46	20.47		0
INCL	130	DB	002	130-DB-002	1	0	0	MILLING / CIL SWITCHROOM UPS DB	8																			0
130-MC-001	130	DB	011	130-DB-011	1	0	1	MILLING / SURGE BIN AREA L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
130-MC-001	130	DB	012	130-DB-012	1	0	1	CIL AREA L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
130-MC-001	130	DB	013	130-DB-013	1	0	1	GOLD ROOM L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
130-MC-001	130	DB	021	130-DB-021	1	0	1	CONTROL ROOM L&SP DB	10	10	DUTY	FDR	1.00	10.0	0.95	10.53		0.80	0.50	4.00	1.31	4.21	0.70	2.80	2.95	24.53		0
130-MC-001	130	BC	001	130-BC-001	1	0	1	HV SWITCHBOARD BATTERY CHARGER	5	5	DUTY	FDR	1.00	5.0	0.95	5.26		0.60	1.00	3.00	0.99	3.16	0.91	2.74	2.88	23.98		0
130-MC-001	130	WR	001	130-WR-001	1	0	1	MILLING 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
130-MC-001	130	WR	002	130-WR-002	1	0	1	CIL 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
130-MC-001	130	WR	003	130-WR-003	1	0	1	ELUTION 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
210-MC-001	210	MC	001	210-MC-001	1	0	0	400V MOTOR CONTROL CENTRE INCOMER																				0
210-MC-001	210	DB	001	210-DB-001	1	0	1	TAILINGS / SERVICES SWITCHROOM L&SP DB	40	40	DUTY	FDR	1.00	40.0	0.95	42.11		0.80	0.50	16.00	5.26	16.84	0.70	11.20	11.79	98.11		0
210-MC-001	210	UP	001	210-UP-001	1	0	1	TAILINGS / SERVICES SWITCHROOM UPS	8	8	DUTY	FDR	1.00	8.0	0.95	8.42		0.80	0.50	3.20	1.05	3.37	0.91	2.92	3.07	25.58		0
INCL	120	DB	002	120-DB-002	1	0	0	TAILINGS / SERVICES SWITCHROOM UPS DB	8																			0
210-MC-001	210	DB	011	210-DB-011	1	0	1	CYANIDE DESTRUCT / SMBS AREA L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
210-MC-001	210	DB	012	210-DB-012	1	0	1	REAGENTS / SERVICES AREA L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	0.50	12.00	3.94	12.63	0.70	8.40	8.84	73.58		0
210-MC-001	210	DB	021	210-DB-021	1	0	1	PLANT WORKSHOP L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	1.00	24.00	7.89	25.26	0.70	16.80	17.68	147.17		0
210-MC-001	210	DB	022	210-DB-022	1	0	1	REAGENTS STORE L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	1.00	24.00	7.89	25.26	0.70	16.80	17.68	147.17		0
210-MC-001	210	DB	023	210-DB-023	1	0	1	PLANT ADMIN L&SP DB	30	30	DUTY	FDR	1.00	30.0	0.95	31.58		0.80	1.00	24.00	7.89	25.26	0.70	16.80	17.68	147.17		0
210-MC-001	210	WR	001	210-WR-001	1	0	1	TAILINGS 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
210-MC-001	210	WR	002	210-WR-002	1	0	1	WATER SERVICES 32A WELDING OUTLET	15	15	DUTY	FDR	1.00	15.0	0.95	15.79		0.80	0.02	0.24	0.08	0.25	0.70	0.17	0.18	1.47		0
360-SB-001	360	SB	001	360-SB-001	1	0	1	PLANT ENTRY INFRASTRUCTURE	150	150	DUTY	FDR	1.00	150.0	0.95	157.89		0.75	1.00	112.00	36.81	117.89	0.91	102.21	107.59	895.39		0
INCL					1	0	0	SECURITY GATEHOUSE & CHANGEROOM	30	30	DUTY	FDR	1.00	30.0	0.95	31.6		0.80	1.00	24.00	7.89	25.26	0.91	21.90	23.06	191.87		0
INCL					1	0	0	METALLURGICAL OFFICE	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	1.00	16.00	5.26	16.84	0.91	14.60	15.37	127.91		0
INCL					1	0	0	LABORATORY	80	80	DUTY	FDR	1.00	80.0	0.95	84.2		0.80	1.00	64.00	21.04	67.37	0.91	58.41	61.48	511.65		0
INCL					1	0	0	AREA LIGHTING	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	0.50	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0
370-SB-001	370	SB	001	370-SB-001	1	0	1	PLANT INFRASTRUCTURE	270	270	DUTY	FDR	1.00	270.0	0.95	284.21		0.77	1.00	208.00	68.37	218.95	0.91	189.82	199.82	1662.86		0
INCL					1	0	0	ADMINISTRATION BUILDING	50	50	DUTY	FDR	1.00	50.0	0.95	52.6		0.80	1.00	40.00	13.15	42.11	0.91	36.50	38.43	319.78		0
INCL					1	0	0	CLINIC & EMERGENCY RESPONSE	25	25	DUTY	FDR	1.00	25.0	0.95	26.3		0.80	1.00	20.00	6.57	21.05	0.91	18.25	19.21	159.89		0
INCL					1	0	0	WAREHOUSE, WORKSHOP & OFFICE	150	150	DUTY	FDR	1.00	150.0	0.95	157.9		0.80	1.00	120.00	39.44	126.32	0.91	109.51	115.28	959.34		0
INCL					1	0	0	PLANT LUNCHROOM	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	1.00	16.00	5.26	16.84	0.91	14.60	15.37	127.91		0
INCL					1	0	0	PLANT ABLUTIONS	5	5	DUTY	FDR	1.00	5.0	0.95	5.3		0.80	1.00	4.00	1.31	4.21	0.91	3.65	3.84	31.98		0
INCL					1	0	0	AREA LIGHTING	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	0.50	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0

Electrical Equipment Load List
Detailed

DRIVE DETAILS													CONNECTED LOAD					MAXIMUM DEMAND					AVERAGE					
SWITCHBOARD	WBS	EQUIPMENT ID	EQUIPMENT NO.	EQUIPMENT TAG	TOT QTY	S/BY QTY	EMERGENCY	EQUIPMENT NAME	NAME PLATE (kW)	INSTALLED (kW)	DUTY	DRIVE TYPE	EFFICIENCY	ABSORBED kW	PF	kVA	HARMONIC LOADING FACTOR	MECHANICAL LOAD FACTOR	DEMAND FACTOR	MD (kW)	MD (kVAR)	MD (kVA)	PLANT AVAILABILITY	AVERAGE (kW)	AVERAGE (kVA)	AVERAGE (MWh/year)	NOTES	REV
380-SB-001	380	SB	001	380-SB-001	1	0	0	ACCOMMODATION CAMP	559.1	559.1	DUTY	FDR	1.00	559.1	0.95	588.53		0.72	1.00	400.08	131.50	421.14	0.91	365.12	384.34	3198.45		0
INCL					7	0	0	TYPE 1 ACCOMMODATION UNIT	8.8	8.8	DUTY	FDR	1.00	61.6	0.95	64.8		0.80	1.00	49.28	16.20	51.87	0.91	44.97	47.34	393.97		0
INCL					21	0	0	TYPE 2 ACCOMMODATION UNIT	7.5	7.5	DUTY	FDR	1.00	157.5	0.95	165.8		0.80	1.00	126.00	41.41	132.63	0.91	114.99	121.04	1007.31		0
INCL					1	0	0	MESS HALL & KITCHEN	120	120	DUTY	FDR	1.00	120.0	0.95	126.3		0.80	1.00	96.00	31.55	101.05	0.91	87.61	92.22	767.47		0
INCL					1	0	0	LAUNDRY	60	60	DUTY	FDR	1.00	60.0	0.95	63.2		0.80	1.00	48.00	15.78	50.53	0.91	43.81	46.11	383.74		0
INCL					5	0	0	MANAGER ACCOMMODATION	4	4	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	1.00	16.00	5.26	16.84	0.91	14.60	15.37	127.91		0
INCL					1	0	0	RECREATION ROOM	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	1.00	16.00	5.26	16.84	0.91	14.60	15.37	127.91		0
INCL					1	0	0	STAFF RECREATION ROOM	15	15	DUTY	FDR	1.00	15.0	0.95	15.8		0.80	1.00	12.00	3.94	12.63	0.91	10.95	11.53	95.93		0
INCL					1	0	0	ADMINISTRATION BUILDING	10	10	DUTY	FDR	1.00	10.0	0.95	10.5		0.80	1.00	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0
INCL					1	0	0	GATE HOUSE	5	5	DUTY	FDR	1.00	5.0	0.95	5.3		0.80	1.00	4.00	1.31	4.21	0.91	3.65	3.84	31.98		0
INCL					1	0	0	FIRE WATER PLANT	50	50	DUTY	FDR	1.00	50.0	0.95	52.6		0.80	0.02	0.80	0.26	0.84	0.91	0.73	0.77	6.40		0
INCL					1	0	0	WATER PLANT	10	10	DUTY	FDR	1.00	10.0	0.95	10.5		0.80	1.00	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0
INCL					1	0	0	SEWAGE TREATMENT PLANT	10	10	DUTY	FDR	1.00	10.0	0.95	10.5		0.80	1.00	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0
INCL					1	0	0	AREA LIGHTING	20	20	DUTY	FDR	1.00	20.0	0.95	21.1		0.80	0.50	8.00	2.63	8.42	0.91	7.30	7.69	63.96		0
450-SB-001	450	SB	001	450-SB-001	1	0	1	MINE SERVICES AREA (ESTIMATED LOAD)	180	180	DUTY	FDR	1.00	180.0	0.90	200.00		0.80	1.00	144.00	69.74	160.00	0.70	100.80	112.00	883.01		0
450-SB-002	450	SB	002	450-SB-002	1	0	1	EXPLOSIVES STORAGE (ESTIMATED LOAD)	20	20	DUTY	FDR	1.00	20.0	0.90	22.22		0.80	1.00	16.00	7.75	17.78	0.70	11.20	12.44	98.11		0

Electrical Equipment Load List
Emergency Loads

EMERGENCY LOAD	EQUIPMENT NAME	MAX DEMAND (kW)	MAX DEMAND (kVA)
120-MC-001		**42.1**	**44.1**
120-DB-001	FEED PREPARATION SWITCHROOM L&SP	32.0	33.7
120-UP-001	FEED PREPARATION SWITCHROOM UPS	6.4	6.7
120-WR-001	FEED PREPARATION 32A WELDING OUTLET	0.2	0.3
121-CN-001	PRIMARY CRUSHER MAINTENANCE HOIST	0.5	0.5
121-ZM-003	PRIMARY CRUSHER HYDRAULIC POWER UNIT	3.0	3.0
130-MC-001		**531.4**	**642.6**
130-BC-001	HV SWITCHBOARD BATTERY CHARGER	3.0	3.2
130-DB-001	MILLING / CIL SWITCHROOM L&SP DB	12.0	12.6
130-DB-011	MILLING / SURGE BIN AREA L&SP DB	12.0	12.6
130-DB-012	CIL AREA L&SP DB	12.0	12.6
130-DB-013	GOLD ROOM L&SP DB	12.0	12.6
130-DB-021	CONTROL ROOM L&SP DB	4.0	4.2
130-UP-001	MILLING / CIL SWITCHROOM UPS	2.6	2.7
130-WR-001	MILLING 32A WELDING OUTLET	0.2	0.3
130-WR-002	CIL 32A WELDING OUTLET	0.2	0.3
130-WR-003	ELUTION 32A WELDING OUTLET	0.2	0.3
132-PP-010	MILLING AREA SUMP PUMP	2.6	3.1
132-ZM-010	SAG MILL LINER HANDLER	24.0	24.0
133-CN-001	CYCLONE AREA DAVIT CRANE	0.1	0.1
162-AG-001	CIL TANK 1 AGITATOR	62.6	78.2
162-AG-002	CIL TANK 2 AGITATOR	62.6	78.2
162-AG-003	CIL TANK 3 AGITATOR	62.6	78.2
162-AG-004	CIL TANK 4 AGITATOR	62.6	78.2
162-AG-005	CIL TANK 5 AGITATOR	62.6	78.2
162-AG-006	CIL TANK 6 AGITATOR	62.6	78.2
162-CN-001	CIL AREA SERVICE CRANE	0.6	0.6
162-PP-007	CIL AREA SUMP PUMP 1	1.3	1.7
162-PP-008	CIL AREA SUMP PUMP 2	1.3	1.7
173-PP-005	ELUTION SUMP PUMP	0.7	0.9
174-KN-001	CARBON REGENERATION KILN	3.0	3.0
176-RC-001	ELECTROWINNING CELL 1 RECTIFIER	29.5	35.7
176-RC-002	ELECTROWINNING CELL 2 RECTIFIER	29.5	35.7
177-CN-001	GOLD ROOM CRANE	0.1	0.1
177-PP-002	GOLD ROOM SUMP PUMP	0.7	0.9
212-CN-001	LIME HOIST	0.1	0.1
212-DC-001	LIME SILO DUST COLLECTOR	4.4	4.4
210-MC-001		**544.1**	**619.2**
183-AG-001	CYANIDE DESTRUCTION TANK 1 AGITATOR	46.7	59.1
183-AG-002	CYANIDE DESTRUCTION TANK 2 AGITATOR	46.7	59.1
183-PP-001	CYANIDE DESTRUCTION SUMP PUMP	1.3	1.7
210-DB-001	TAILINGS / SERVICES SWITCHROOM L&SP DB	16.0	16.8
210-DB-011	CYANIDE DESTRUCT / SMBS AREA L&SP DB	12.0	12.6
210-DB-012	REAGENTS / SERVICES AREA L&SP DB	12.0	12.6
210-DB-021	PLANT WORKSHOP L&SP DB	24.0	25.3
210-DB-022	REAGENTS STORE L&SP DB	24.0	25.3
210-DB-023	PLANT ADMIN L&SP DB	24.0	25.3
210-UP-001	TAILINGS / SERVICES SWITCHROOM UPS	3.2	3.4
210-WR-001	TAILINGS 32A WELDING OUTLET	0.2	0.3
210-WR-002	WATER SERVICES 32A WELDING OUTLET	0.2	0.3
211-AG-001	CYANIDE MIXING TANK AGITATOR	1.0	1.5
211-CN-001	CYANIDE HOIST	0.1	0.1
211-PP-005	CYANIDE AREA SUMP PUMP	0.7	0.9
214-AG-001	CAUSTIC MIXING AGITATOR	1.0	1.5
214-PP-003	ACID AREA SUMP PUMP	0.7	0.9
216-AG-001	SMBS MIXING TANK AGITATOR	1.0	1.5
216-CN-001	SMBS HOIST	0.1	0.1
216-PP-004	SMBS AREA SUMP PUMP	0.7	0.9
219-AG-001	COPPER SULPHATE MIXING TANK AGITATOR	0.7	1.2

222-PP-004	RAW WATER PUMP 1	46.7	59.1
223-PP-001	PROCESS WATER PUMP 1	92.3	103.8
225-PP-001	GLAND WATER PUMP 1	4.9	6.1
226-HX-001	COOLING TOWER	20.8	20.8
226-PP-003	COOLING WATER PUMP 1	9.5	12.4
228-PP-002	FIRE WATER PUMP (ELECTRIC)	75.4	88.7
232-ZM-001	WATER TREATMENT PLANT	8.1	8.1
233-PP-001	SEWAGE MACERATOR PUMP STATION 1	1.2	1.2
233-ZM-001	SEWAGE TREATMENT PLANT	8.8	8.8
241-CO-001	PLANT AIR COMPRESSOR 1	60.0	60.0
241-CO-002	PLANT AIR COMPRESSOR 2	0.0	0.0
350-SB-001		**2.4**	**2.4**
233-PP-002	SEWAGE MACERATOR PUMP STATION 2	1.2	1.2
450-SB-001		**145.2**	**161.2**
450-SB-001	MINE SERVICES AREA (ESTIMATED LOAD)	144.0	160.0
450-SB-002		**16.0**	**17.8**
450-SB-002	EXPLOSIVES STORAGE (ESTIMATED LOAD)	16.0	17.8
360-SB-001		**112.0**	**117.9**
360-SB-001	PLANT ENTRY INFRASTRUCTURE	112.0	117.9
370-SB-001		**208.0**	**218.9**
370-SB-001	PLANT INFRASTRUCTURE	208.0	218.9
Grand Total		**1602.3**	**1825.3**
Expected Diversity (Not all loads will be used on blackout)			**0.9**
Proposed Generator Capacity (kVA)			**2000**
Utilisation			**82.14%**

Electrical Equipment Load List
Definitions

Nameplate kW	Nameplate rating of each item of equipment
Connected load	Input power required to obtain an output power equal to the nameplate rating of each item of equipment Connected load kW = Nameplate kW ÷ Efficiency Connected load kVA = Connected load kW ÷ Power factor
Load factor	Represents the portion of the nameplate rating that is required by the load under normal operating conditions
Demand factor	The demand factor allows for the period which the equipment operates on its normal schedule, i.e. continuously (demand factor =1.00), intermittently (demand factor =0.02) or only operates when the plant is shutdown (demand factor = 0.00). This factor modifies the equipment's power demand in the total maximum demand calculation.
Maximum demand	The amount of power required from the electrical supply system to serve the load. The ½ hour maximum demand kW are used in the calculation of plant maximum demand. Maximum demand kW = Connected load x Load factor Maximum demand kVAr = Maximum demand kW x Tan ($\cos^{-1}$ pf) where 'pf' is the power factor Maximum demand kVA = √((Maximum demand kW)^2 + (Maximum demand kVAr)^2)
Operating factor	The proportion of time which each item of equipment operates per day. The operating factor takes into account the plant availability.
Average power	Total power consumed by each item of equipment over one year and calculated in MWhours per year. The 24 hour maximum demand kW are used in the calculation of average power. MWh/year = Maximum demand kW x 10^{-3} x operating factor x 24 x 365

TOSHIBA MOTOR PERFORMANCE DATA (415V, 50Hz, 4 POLE) - PREMIUM EFFICIENCY

OUTPUT (KW)	EFFICIENCY (%) @ 75% LOAD	EFFICIENCY (%) @ FULL LOAD	POWER FACTOR AT 75% LOAD	POWER FACTOR AT FULL LOAD
0.18	63.0%	63.5%	0.61	0.7
0.25	69.0%	72.7%	0.67	0.71
0.37	73.9%	75.5%	0.56	0.65
0.55	79.4%	80.4%	0.62	0.72
0.75	81.5%	82.2%	0.64	0.73
1.10	85.5%	84.7%	0.69	0.77
1.50	87.1%	86.2%	0.66	0.74
2.20	87.7%	87.1%	0.74	0.81
3.00	87.8%	87.2%	0.74	0.81
4.00	88.5%	88.3%	0.85	0.8
5.50	90.7%	90.5%	0.79	0.83
7.50	91.5%	91.1%	0.73	0.78
11.00	92.4%	92.3%	0.77	0.81
15.00	92.7%	92.5%	0.76	0.81
18.50	93.8%	93.6%	0.77	0.8
22.00	93.7%	94.1%	0.74	0.79
30.00	94.0%	94.1%	0.82	0.85
37.00	94.5%	94.6%	0.75	0.8
45.00	95.3%	95.1%	0.80	0.82
55.00	94.2%	94.4%	0.79	0.83
75.00	95.9%	95.6%	0.80	0.84
90.00	95.5%	95.6%	0.85	0.87
110.00	95.3%	95.3%	0.89	0.91
132.00	95.7%	95.5%	0.86	0.86
150.00	95.7%	95.5%	0.89	0.89
185.00	94.9%	95.0%	0.86	0.88
200.00	95.1%	95.1%	0.88	0.87
220.00	94.8%	94.8%	0.85	0.87
250.00	94.4%	94.5%	0.84	0.86
280.00	94.9%	94.9%	0.82	0.85
355.00	95.5%	95.3%	0.89	0.9

0.18W IS TAKEN FROM WEG HIGH EFFICIENCY E3 CATALOGUE (PAGE 25)
0.25KW IS TAKEN FROM WEG HIGH EFFICIENCY E3 CATALOGUE (PAGE 25)

SCHNEIDER ATV71 VSD DATA (400V, 50Hz)

OUTPUT (KW)	EFFICIENCY (%) @ FULL LOAD	DISPLACEMENT POWER FACTOR AT FULL LOAD
0.37	94.5%	0.996
0.75	94.5%	0.996
1.50	95.9%	0.995
2.20	96.2%	0.995
3.00	96.3%	0.997
4.00	96.5%	0.994
5.50	96.9%	0.998
7.50	97.2%	0.994
11.00	97.2%	0.995
15.00	97.5%	0.994
18.50	97.4%	0.997
22.00	96.8%	0.995
30.00	96.8%	0.996
37.00	96.9%	0.996
45.00	97.1%	0.993
55.00	97.2%	0.994
75.00	97.0%	0.981
90.00	97.4%	0.999
110.00	97.6%	0.999
132.00	97.6%	0.999
160.00	97.7%	0.999
200.00	97.6%	0.999
250.00	97.7%	0.998
280.00	97.6%	0.998
315.00	97.7%	0.997
400.00	97.7%	0.996
500.00	97.8%	0.995

APPENDIX 6.5

SITE GENERAL LAYOUT

DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D
		2	02MAY17	GENERAL REVISION	EL			BR	BR	PH	
		1	23MAR17	UPDATED DFS ADDENDUM - PLANT REPOSITIONED	EL			BR	BR	PH	
XX	XXX	0	08SEP16	ISSUED FOR FEED	TJJ			BR	DG	BR	

CLIENT: KEFI MINERALS ETHIOPIA PLC

PROJECT: TULU KAPI GOLD PROJECT

Lycopodium

Lycopodium Minerals Pty Ltd ABN 34 055 880 209
Level 5, 1 Adelaide Terrace, East Perth, Western Australia 6004
T: +61 (0) 8 6210 5222 www.lycopodium.com.au

KEFI MINERALS

DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE: TREATMENT PLANT - GENERAL OVERALL SITE LAYOUT PLAN

SCALE	JOB No.	DRG No.	REV.
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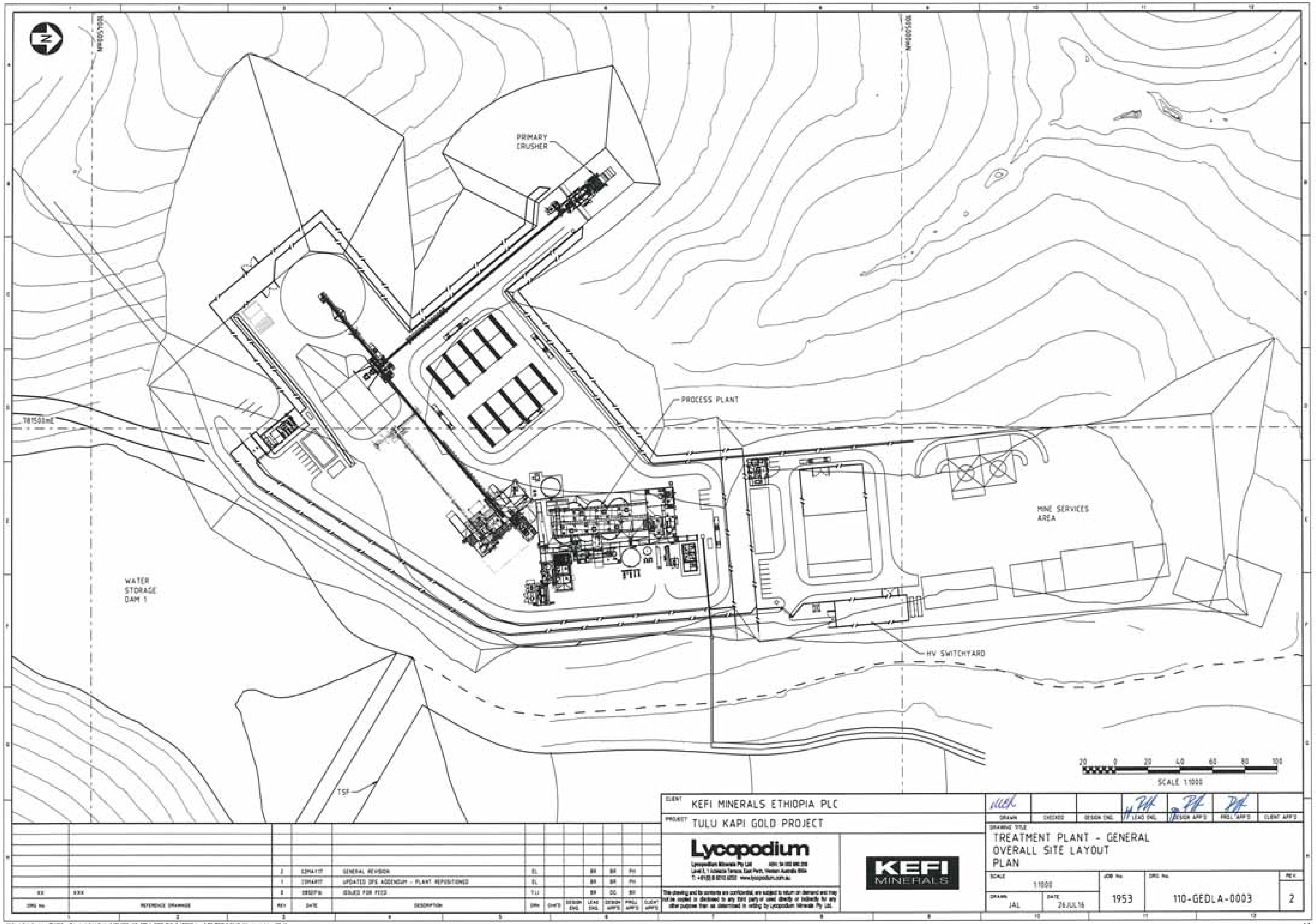
DRAWN: JAL DATE: 26JUL16

A1



1005000mN
1004500mN
781500mE
PRIMARY CRUSHER
PROCESS PLANT
MINE SERVICES AREA
HV SWITCHYARD
WATER STORAGE DAM 1
TSF
SCALE 1:1000
20 0 20 40 60 80 100
CLIENT KEFI MINERALS ETHIOPIA PLC
PROJECT TULU KAPI GOLD PROJECT
Lycopodium
KEFI MINERALS
DRAWING TITLE TREATMENT PLANT - GENERAL OVERALL SITE LAYOUT PLAN
SCALE 1:1000
DRAWN JAL
DATE 26JUL16
JOB No. 1953
DWG No. 110-GEDLA-0003
REV 2
2 02MAY17 GENERAL REVISION EL BR BR PH
1 20MAR17 UPDATED DFS ADDENDUM - PLANT REPOSITIONED EL BR BR PH
0 26SEP16 ISSUED FOR FEED TJJ BR DG BR
XX XXX
DWG No. REFERENCE DRAWINGS
REV DATE DESCRIPTION DRN CHK'D DESIGN ENG. LEAD ENG. DESIGN APP'D PROJ. APP'D CLIENT APP'D
DRAWN CHECKED DESIGN ENG. LEAD ENG. DESIGN APP'D PROJ. APP'D CLIENT APP'D
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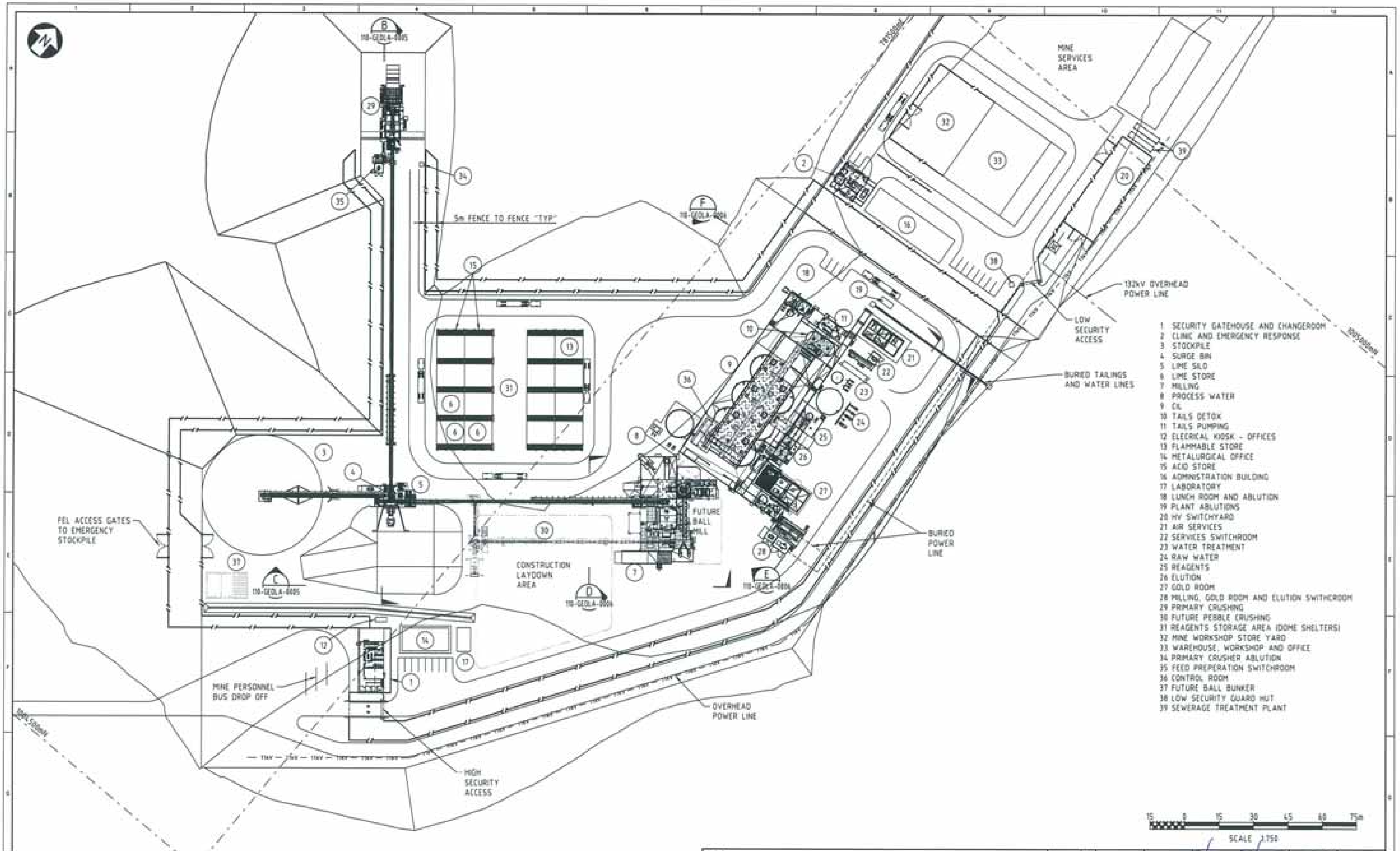

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XX	XXX	0	[illegible]	ISSUED FOR FEED	TJJ			BR	DG	BR	

CLIENT: KEFI MINERALS ETHIOPIA PLC

PROJECT: TULU KAPI GOLD PROJECT

Lycopodium

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KEFI MINERALS

DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE: TREATMENT PLANT - GENERAL PLANT LAYOUT PLAN

SCALE	JOB No	DRG No	REV
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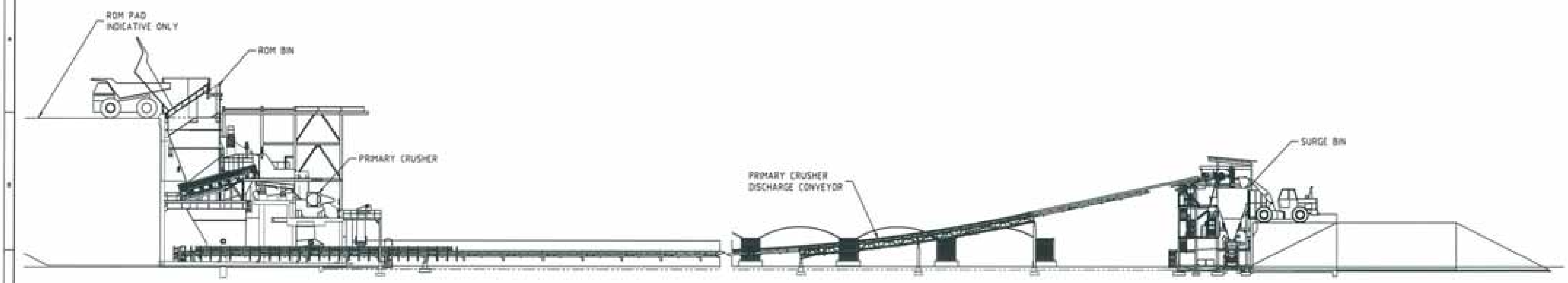
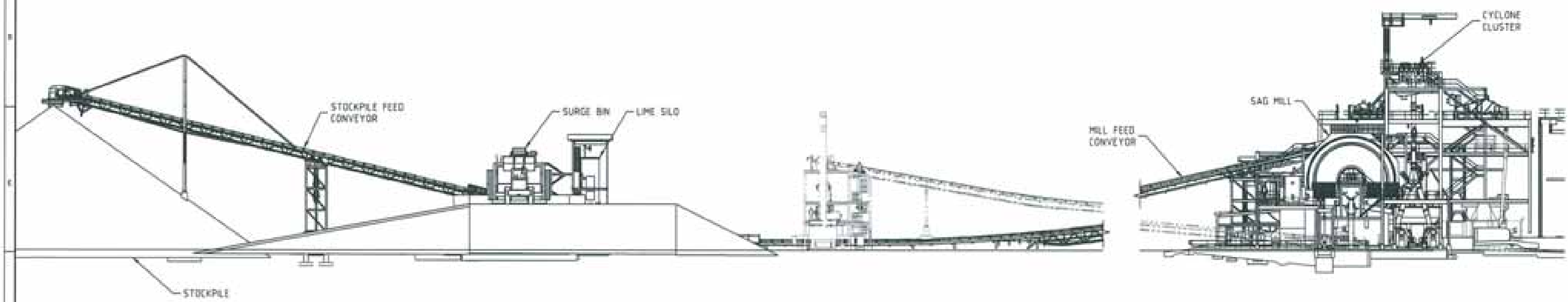
DRAWN: JAL — DATE: 20JUL16

A1



SECTION B 110-GEDLA-0004



VIEW C 110-GEDLA-0004

SCALE 1:250

DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
		1	23MAR17	UPDATED DFS ADDENDUM - PLANT REPOSITIONED	EL			BR	BR	PH	
XX	XXX	0	08SEP16	ISSUED FOR FEED	TJJ			BR	DG	BR	

CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

Lycopodium
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KEFI MINERALS

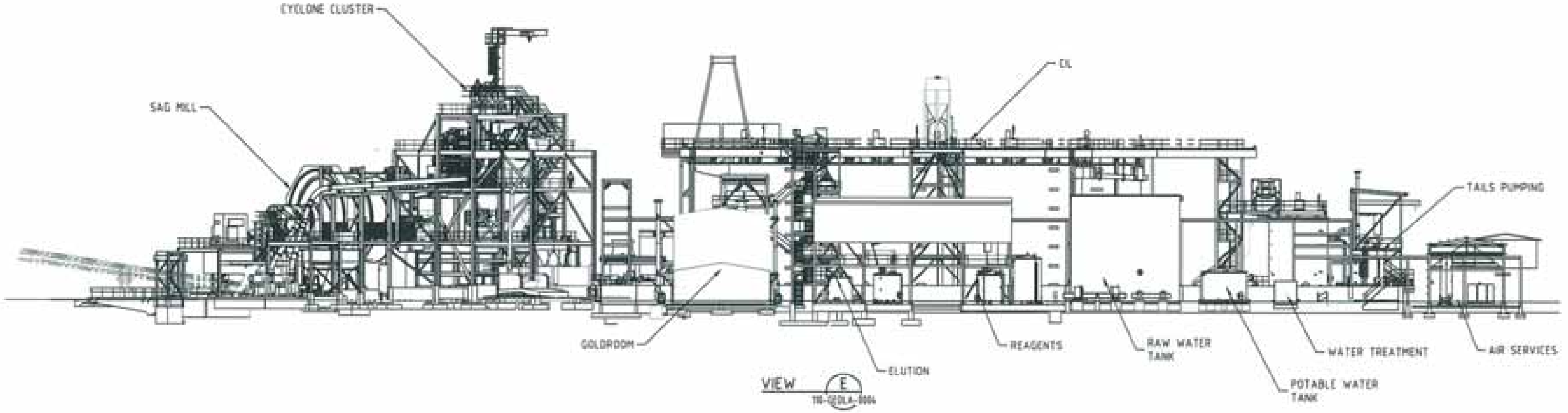
DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
TREATMENT PLANT - GENERAL
PLANT LAYOUT
SECTION AND VIEW

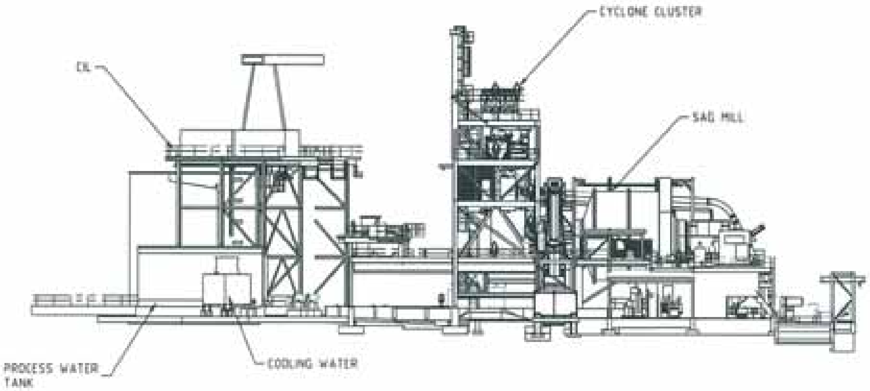
SCALE	JOB No	DRG No	REV
1:250	1953	110-GEDLA-0005	1

DRAWN TJJ DATE 07SEP16

A1



VIEW E
110-GEDLA-0004



SECTION D
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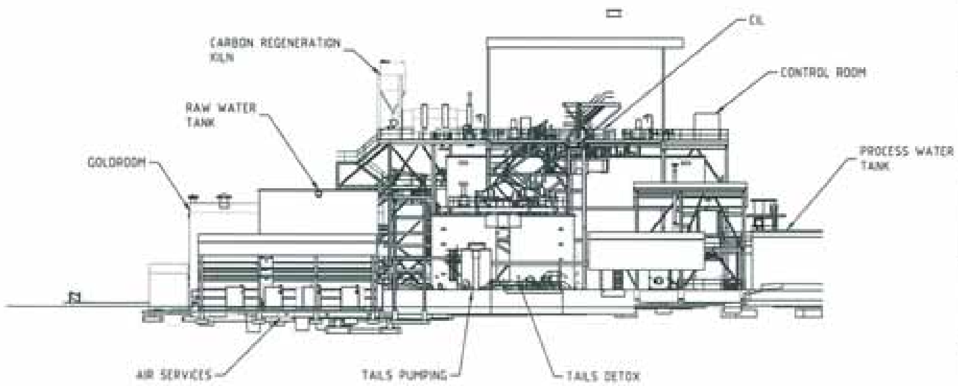

VIEW F
110-GEDLA-0004

SCALE 1:250

CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

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KEFI MINERALS

DRAWING TITLE
TREATMENT PLANT - GENERAL
PLANT LAYOUT
SECTION AND VIEWS

SCALE 1:250 | DRAWN TJJ | DATE 07SEP16 | JOB No. 1953 | DWG No. 110-GEDLA-0006 | REV. 1

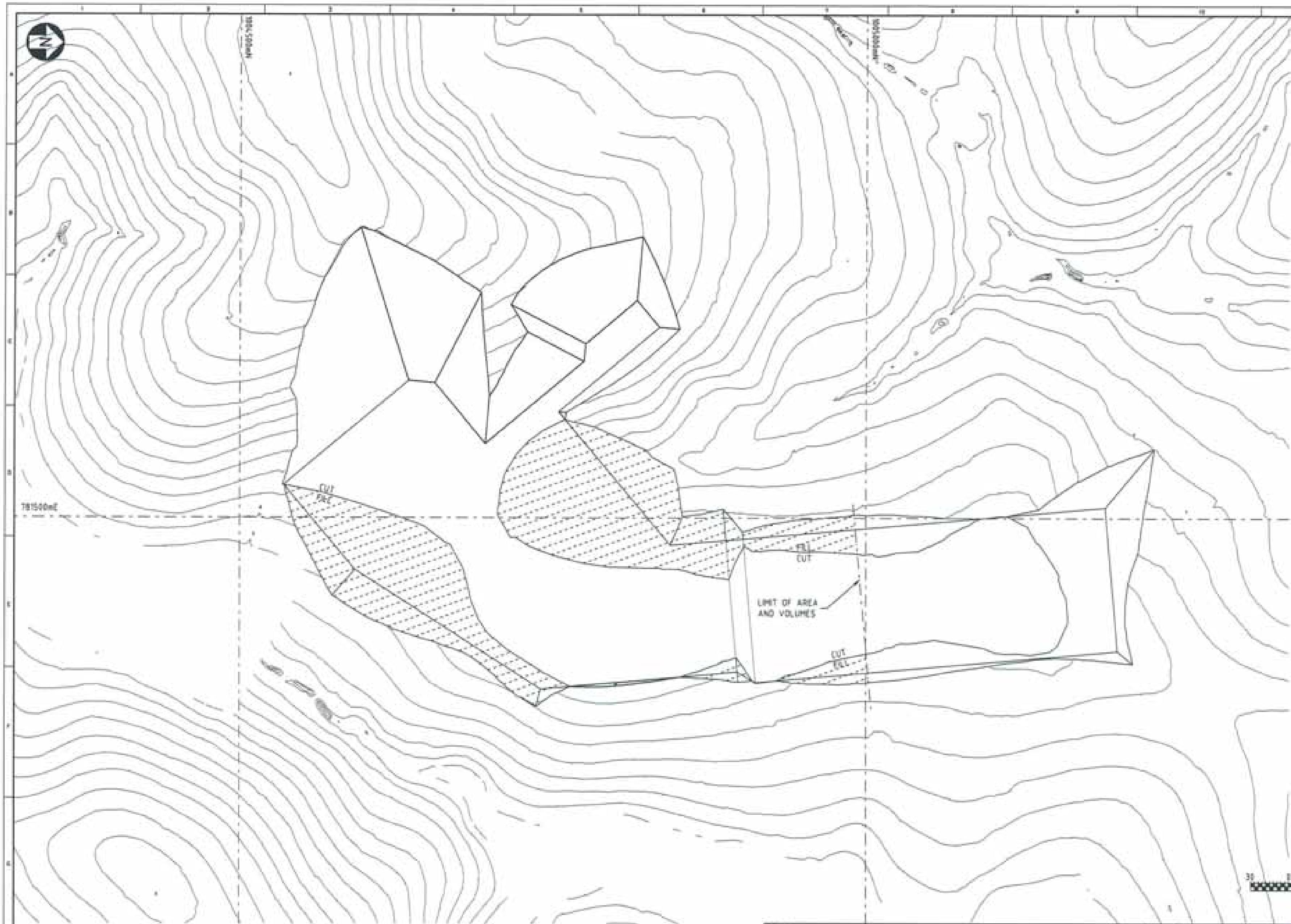
REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ APP'D	CLIENT APP'D
1	23MAY17	UPDATED DFS ADDENDUM - PLANT REPOSITIONED	EL		BR	BR	PH		
0	08SEP16	ISSUED FOR FEED	TJJ		BR	DG	BR		

DWG No.	REFERENCE DRAWINGS
XX	XXX

VOLUMES
CUT = 425 200 m³
FILL = 147 200 m³

CLEAR AND GRUB AREA = 14ha

Topsoil at 0.3m deep = 42000 m³



30 0 30 60 90 120 150m
SCALE 1:1500

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DRG No	REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DRN	CHK'D	DESIGN ENG	LEAD ENG	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

CLIENT KEFI MINERALS ETHIOPIA PLC

PROJECT TULU KAPI GOLD PROJECT

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DRAWN	CHECKED	DESIGN ENG.	LEAD ENG.	DESIGN APP'D	PROJ. APP'D	CLIENT APP'D

DRAWING TITLE
TREATMENT PLANT - GENERAL
BULK SITE EARTHWORKS
PLAN

SCALE	JOB No	DRG No	REV
1:500	1953	111-GEDLA-0001	0
DRAWN JAL	DATE 23SEP16		

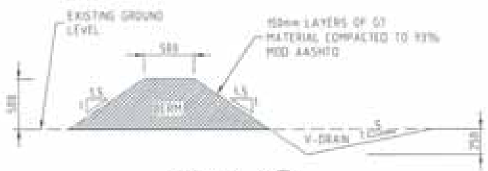
A1

LEGEND

EXISTING SURFACE CONTOURS (5m INTERVALS)
BOUNDARY FENCE

BUILDINGS

1. 7 BLOCKS TYPE 1 ACCOMMODATION UNITS (8m x 18m)
2. 21 BLOCKS TYPE 2 ACCOMMODATION UNITS (7m x 14m)
3. MESS HALL AND KITCHEN ROOM
4. LAUNDRY AND IRONING ROOM
5. 9 BLOCKS MANAGER ACCOMMODATION (5m x 7m)
6. RECREATION BLOCK
7. GENERAL STAFF RECREATION
8. ADMINISTRATION BLOCK
9. GATE HOUSE
10. FIRE WATER PLANT
11. WATER PLANT
12. GENERATOR
13. ELECTRICAL TRANSFORMER
14. CARPARK (30 BAYS)
15. BUS DROP OFF AREA
16. SEWERAGE TREATMENT PLANT



SECTION A
1:25
TYPICAL SECTION TROUGH STORM WATER BERM

SCALE 1:25
SCALE 1:500

CLIENT: KEFI MINERALS ETHIOPIA PLC
PROJECT: TULU KAPI GOLD PROJECT

Lycopodium

KEFI MINERALS

DRAWING TITLE: ACCOMMODATION VILLAGE GENERAL ARRANGEMENT VILLAGE LAYOUT

SCALE	JOB No.	DRG No.	REV
1:500 UNO	1953	380-GEDLA-0001	0

DRAWN AC DATE 03SEP16

REV	DATE	DESCRIPTION	DRN
0	06SEP16	ISSUED FOR FEED	AC

APPENDIX 6.6

MILL SIZING

Email Report No.7743 Rev 1

August 2016

EMAIL TRANSMISSION			
Company:	Lycopodium Minerals	**Date:**	4 August 2016
To:	Geoff Duckworth	**Email:**	Geoff.Duckworth@Lycopodium.com.au
CC:	Bruno Ruggiero	**Email:**	Bruno.ruggiero@Lycopodium.com.au
From:	Fred Kock	**No. Pages:**	8 (including this cover page)
Tulu Kapi Project **Revised Mill Size**			

Geoff,

Attached please find the latest modelling incorporating the data derived from applying specific grinding energies at various grind sizes into the mine model.

Yours sincerely,

ORWAY MINERAL CONSULTANTS (WA) PTY LTD

Fred Kock

Principal Metallurgist

Orway Mineral Consultants (WA) Pty Ltd
Level 4, 1 Adelaide Terrace, East Perth, Western Australia 6004 | +61 8 6210 5601 | omc@orway.com.au | www.orway.com.au

LYCOPODIUM MINERALS

TULU KAPI MILL SIZE

1.0 INTRODUCTION

Geoff Duckworth, representing Lycopodium Minerals, requested OMC to provide a mill size for the Tulu Kapi Project in Ethiopia.

To conduct the modelling, OMC provided specific energy requirements for each comminution sample tested at P_{80} grind sizes of 75, 106, 125 and 150 µm to enable the resource modelling to better account for the hardness profile.

The OMC Power Model for grinding circuit modelling and mill sizing is based on a consideration of the total power involved in the comminution process[1].

By applying the specific energy at each comminution sample location a more representative hardness profile was generated. Note the following detail from the Mining Consultant: *To generate these values, the Specific Energy values for samples tested by OMC were coded into the resource block model, based on their spatial location within deposit. The coding was carried out using a simple nearest neighbour technique so there is no transition between zones of hardness. The block model was then run through the mine schedule process and the values were output (along with the processing schedule) for each time period on a tonnes weighted average basis.*

The specific grinding energy that was provided to the resource consultants is summarised in Table 1-1. The energy estimation is based on a typical SAG milling approach (10% ball charge, 75% Nc speed).

[1] OMC POWER-BASED COMMINUTION CALCULATIONS FOR DESIGN, MODELLING AND CIRCUIT OPTIMIZATION - P. Scinto, A. Festa, B. Putland – CMP Conference

Table 1-1 Comminution Specific Energies Provided to Resource Consultants

Sample Number	Hole	From-To	Axb	BWi (kWh/t)	Specific Energy to 75µm (kWh/t)	Specific Energy to 106µm (kWh/t)	Specific Energy to 125µm (kWh/t)	Specific Energy to 150µm (kWh/t)
PFS 11	TKBH41	215.9 - 229.5	253	17.6	16.0	13.1	11.8	10.5
PFS 16	TKBH43	68.4-79.9		17.6	15.9	13.0	11.8	10.5
PFS 19	TKBH41	281.9-306.9		17.9	16.1	13.1	11.8	10.5
PFS 27	TKBH38	244.0-259.9		19.4	17.3	14.0	12.6	11.2
BFS Ox	TKMT003	8.35-16.55	112	15.5	16.6	14.1	13.0	11.9
	TKMT004	14.37-15.9						
	TKMT004	22.32-25.05						
Ox Variability V4	TKMT005	19.2-20.75	253	9.4	9.9	8.4	7.7	7.1
Ox Variability V9	SAP Zone 2 (SP201 - SP212)		357	12.1	11.9	9.9	9.0	8.2
Ox Variability V10	SAP Zone 3 (SP301 - SP310)		749	6.8	7.7	6.5	6.0	5.4
BFS Fresh Lode 1	TKMT004	25.05 - 63.7	82	15.5	18.0	15.5	14.4	13.3
BFS Fresh Lode 3	TKMT001	385.62-395.23	39	18.0	25.2	22.2	21.0	19.7
	TKMT001	418.15-424.6						
	TKMT001	425.08-457						
Fresh Comminution Variability 1	Refer OMC Report no 8865		72	15.0	18.4	15.9	14.9	13.8
Fresh Comminution Variability 2	Refer OMC Report no 8865		48	17.7	23.0	20.1	18.9	17.6
Fresh Comminution Variability 3	Refer OMC Report no 8865		39	17.8	24.9	22.0	20.7	19.5
Fresh Comminution Variability 4	Refer OMC Report no 8865		31	19.1	28.2	25.1	23.8	22.6
Fresh Comminution Variability 5	Refer OMC Report no 8865		46	15.0	21.3	18.8	17.8	16.7

2.0 DESIGN CRITERIA

The design criteria used for mill selection is summarised in Table 2-1

Table 2-1 Design Criteria

Parameter	Units	Criteria	Source
Production	Mtpa	1.5	Client
Grinding Circuit			
Availability	%	91.3	Client
Annual Operating Hours	h	8,000	Client
Throughput	t/h	187.5	Client
Final Product Size, P_{80}	µm	125 - 150	Client
Design Specific Energy	kWh/t	17.7	85^{th} Percentile of Monthly Blends
Testwork			
BWi	kWh/t	15.5	Derived from design energy
A		78.8	Derived from design energy
b		0.6	Derived from design energy
Axb		45.7	Derived from design energy
Ai	g	0.384	Weighted Average
SG		2.76	Weighted Average

The design point is based on the 85^{th} percentile of the modelled monthly specific energies to achieve a product size of 80% passing 125µm to 150µm throughout the project life. The design testwork was back calculated to reflect the design specific energy.

Targeting a grind size in the region of 125 to 150 µm for primary ore, depending on the blend of primary ore types presented to the process plant, has a number of advantages:

- Controlling cyclone overflow density in a process plant with no pre-leach thickening often means classification efficiency is compromised to ensure leach feed density is maintained. It is important to maintain leach feed density when processing ‘clean’ primary ores because suspending coarse particles (>250 µm) becomes problematic. CIL tanks can potentially build up with coarse particles which are difficult to remove from tanks without taking tanks off line and manually cleaning out. Targeting a grind P_{80} in the region of 125 to 150 µm will reduce the proportion of particles in the size region that may cause suspension problems and allow for some variation in classification efficiency and the general ability of the plant operators to maintain the target grind size.

- The process plant will be designed to have a hydraulic capacity capable of handling a throughput rate of 1.7 Mtpa when treating oxide ore. The target primary ore treatment rate is 1.5 Mtpa, however, depending on the ore locations that make up the primary ore blends and the classification efficiency and suspension characteristics of coarse ore particles it may be possible to marginally increase design primary ore throughput rates during some periods. This may have project cash flow benefits or allow overall tonnages treated annually to meet budget if throughput is reduced below design during periods of higher than design ore hardness.

The resource modelling output, showing the monthly specific energies required at various grind sizes compared to the design point are shown in Figure 2-1.

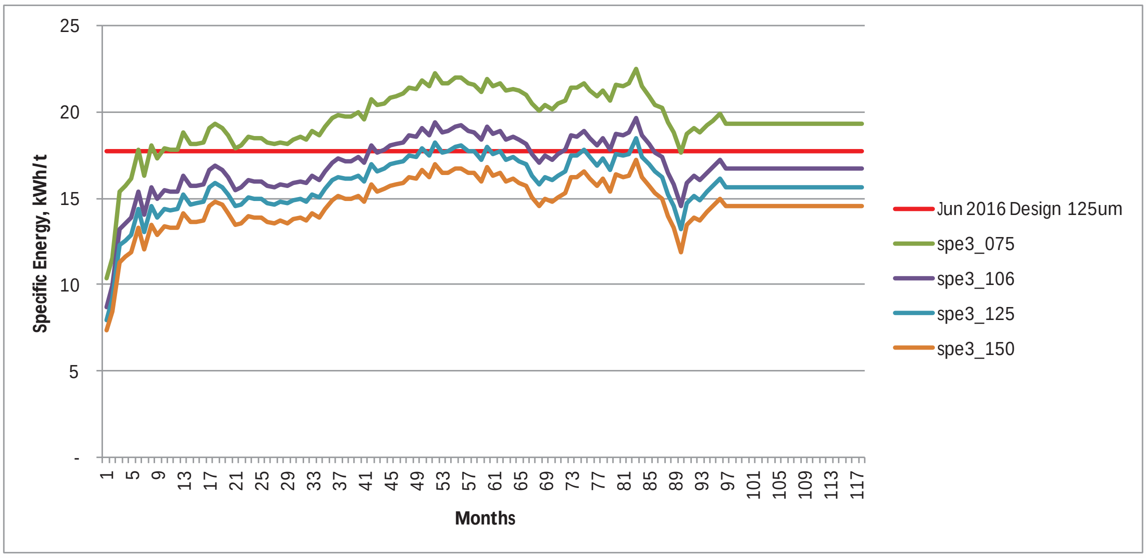


Figure 2-1 Energy requirements at various grind sizes

The feed contribution of each ore type is shown in Figure 2-2. Please note: the reference to SAP, FRESH and HARD are the original DFS hardness classification used (i.e. using the 1600 mRL FRESH / HARD boundary) and is not directly comparable to the hardness profile as shown in Figure 2-1.

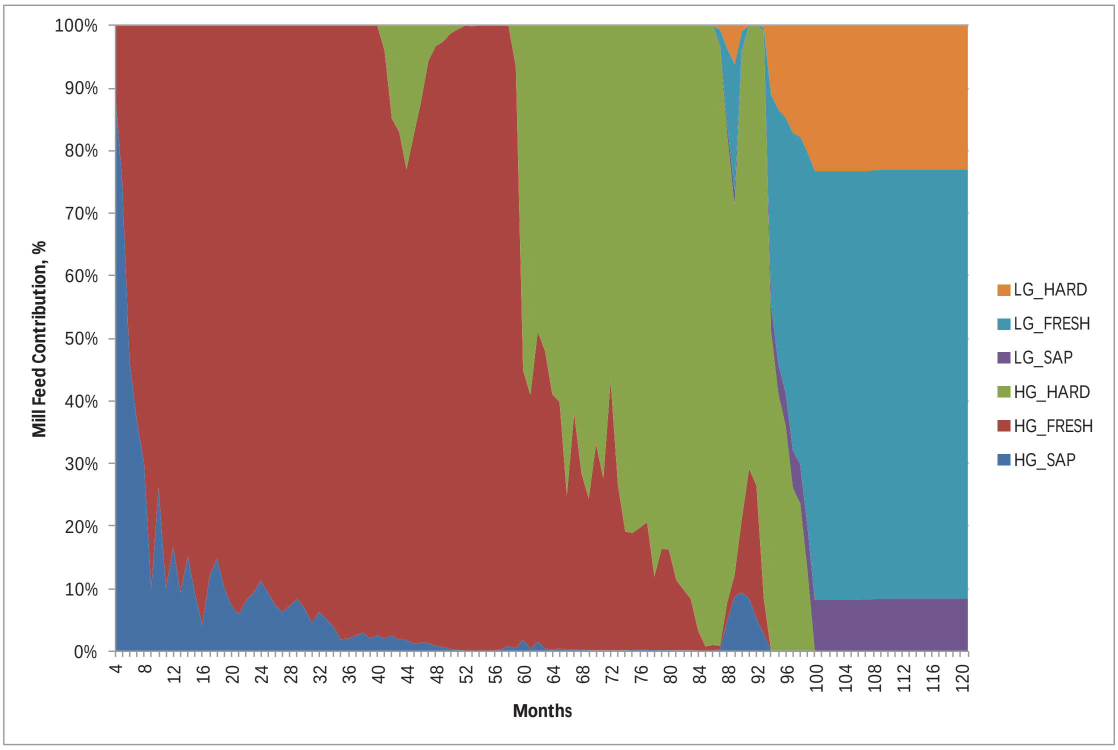


Figure 2-2 Feed Blend (July 2016)

3.0 MILL SELECTION

The mill selection is shown in Table 3-1. Two scenarios are shown, namely the mill conditions to achieve the design of 17.7kWh/t pinion power, and also the turndown required to achieve the average specific energy for the first twelve months of operation, namely 13.0kWh/t.

Table 3-1 SS SAG Mill Sizes

Parameter	Units	Design	Turndown
Mill Type		SS SAG Mill	SS SAG Mill
Number of Mills	-	1	1
Inside Shell Diameter	m	6.70	6.70
Effective Grinding Length (EGL)	m	6.20	6.20
L:D Ratio	-	0.93	0.93
Imperial Measurements	ft x ft	22 x 20.3	22 x 20.3
Mill Discharge Type	-	Grate	Grate
Mill Discharge Percent Solids	%	75	75
Liner Thickness – new	mm	100	100
Mill Speed Range	-	60-80	60-80
Mill Speed – Duty	%Nc	75	**60**
Mill Speed – Duty	rpm	12.5	10.0
Ball Charge – Duty	%	11	12
Ball Charge – Maximum	%	16	16
Total Load – Duty	%	25	17
Total Load – Maximum	%	35	35
Specific Energy	**kWh/t**	**17.7**	**13.0**
Pinion Power – Duty	kW	3,320	2,440
Pinion Power – Maximum	kW	4,360	4,360
Recommended Installed Power*	**kW**	**4,600**	**4,600**

*SAG mill motor sized at 80% Nc, 16% ball charge, 35% total load and 95% motor efficiency

The selected mill provides some contingency during the early years of operation. Indications are that a pebble crusher is not required in the circuit, though it may be beneficial in the later years of the project when processing the harder ore. As such OMC would strongly recommend including the pebble crusher in the layout design so that it can be retrofitted later.

A 22' mill diameter is recommended as a minimum to limit slurry pooling. The use of a 24' mill could be considered as a cost effective option if a suitable design is available (from an engineering and mill vendor perspective).

4.0 RECOMMENDATION

The approach of linking the comminution samples to the resource model is not OMC's typical design basis. Allowing for some extra contingency is thus prudent since the design point is effectively a weighted average value. OMC cannot comment on how well the hardness profile represents the overall resource as there are only 15 samples on which to base the hardness profile.

In order to ensure all parties understand and quantify the risk, the individual sample energy requirements to achieve a product size P_{80} of 125µm and 150µm are shown in relation to the nominal and maximum operating conditions of the selected mill. It is evident from Figure 4-1 that when significant amounts of the Hard Fresh ore is processed, that the mill could struggle. Blend management is therefore of utmost importance.

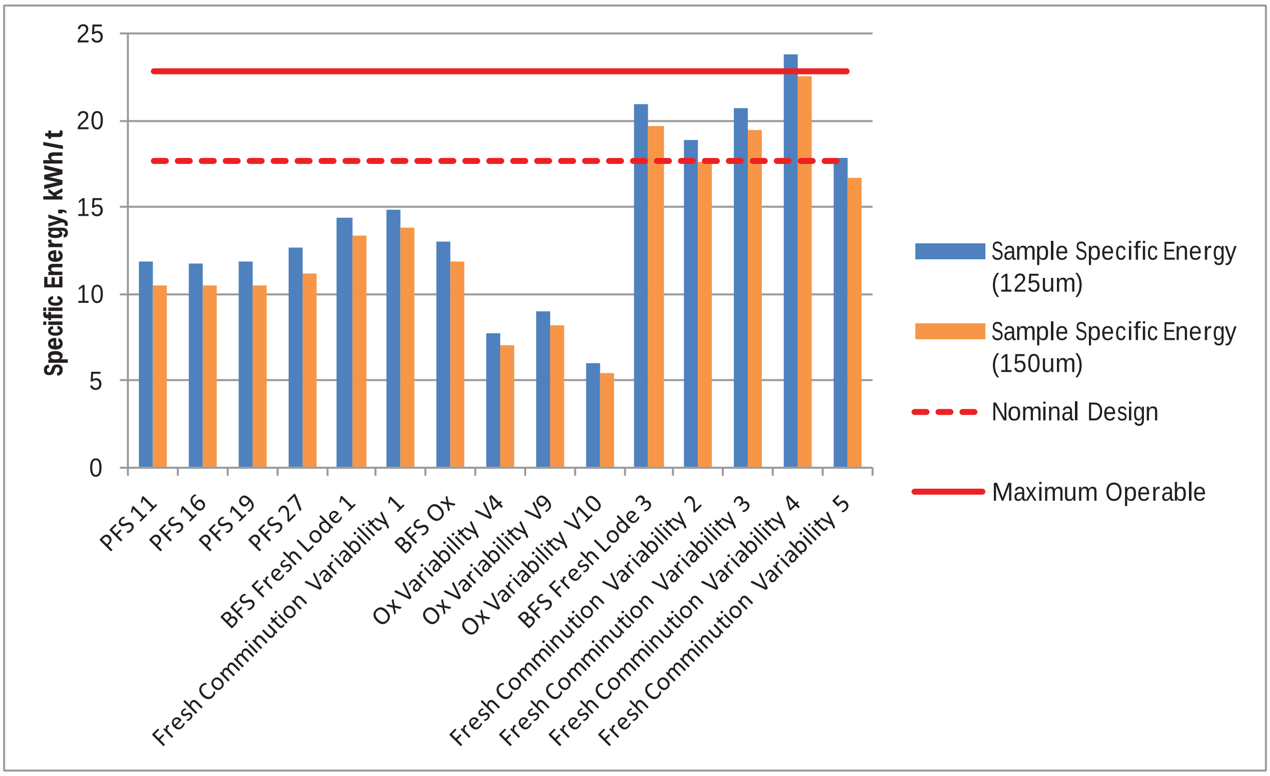


Figure 4-1 Selected mill in relation to the original samples

5.0 DISCLAIMER

The material and advice produced by OMC as contained in this report is for the internal use of the client only and OMC takes no responsibility and accepts no liability for the use of or reliance upon any such material or advice by any third party. Should a third party suffer any loss or damage as a result of using or relying upon such material or advice, OMC shall in no way be liable to the client or the third party.

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Prepared by ORWAY MINERAL CONSULTANTS (WA) PTY LTD:

Fred Kock

Principal Metallurgist

Countersigned by:

Brian Putland

Principal Metallurgist

APPENDIX 7.1

TSF AND WATER DAM - FIGURES

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT

TAILINGS STORAGE FACILITY AND WATER MANAGEMENT SYSTEM – LYCOPODIUM REPORT SUMMARY

PREPARED FOR:

Lycopodium Minerals Pty Ltd
Level 5
1 Adelaide Terrace
East Perth WA 6004

PREPARED BY:

Knight Piésold Pty Limited
Level 1, 184 Adelaide Terrace
East Perth, WA 6004, AUSTRALIA
p. +61 8 9223 6300 • f. +61 8 9223 6399

PE402-00012/02
Rev C
April, 2017

Knight Piésold
CONSULTING
www.knightpiesold.com

DOCUMENT CONTROL PAGE

KEFI MINERALS PLC

TULU KAPI GOLD PROJECT

TAILINGS STORAGE FACILITY AND WATER MANAGEMENT SYSTEM

KP Job No. PE402-00012/04

KP Report No.: PE402-00012/02

CONTRACT
PROJECT CONTRACT

DOCUMENT INFORMATION

REV	DESCRIPTION	PREPARED	REVIEW	KNIGHT PIESOLD APPROVAL	DATE
A	Issued as Draft	PM PLV	DJTM DJTM	DJTM DJTM	09/03/2017
B	Revised Based on Changed Throughput Values	PLV PLV	DJTM DJTM	DJTM DJTM	28/03/2017
C	Revised Based on Changed Throughput Values	PDM	PLV	DJTM	12/04/2017

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CONTENTS **PAGE**

1. INTRODUCTION

1.1 DESIGN CRITERIA AND OBJECTIVES

1.1.1 Design Objectives

The design objectives for the Tailings Storage Facility (TSF) are as follows:

- Permanent and secure containment of all solid waste materials.
- Maximisation of tailings densities using sub-aerial deposition.
- Removal and reuse of free water.
- Reduction of seepage.
- Containment of design storm events within the TSF.
- Ease of operation.
- Rapid and effective rehabilitation.

The design objectives for the water management and sediment control system are as follows:

- Diversion of rainfall runoff from catchment areas upstream of the TSF, around site infrastructure to discharge off site downstream of the project.
- Supply of raw water for plant use.
- Reduction of sediment-laden runoff from the site infrastructure using source control measures, to reduce sediment loading.

1.1.2 Design Criteria

1.1.2.1 Consequence Category

<u>Population at Risk</u>

Based on the preliminary dam break assessment the population at risk (PAR) falls in the 1 to 10 category.

<u>Severity Level</u>

The severity level for a dam break is assessed as Medium to Major.

<u>Consequence Category</u>

Based on ANCOLD “Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure” May 2012 the consequence category for the facility is rated as ‘High C’.

1.1.2.2 Design Criteria

Based on the Consequence Category the following design criteria were used:

- Extreme Storm Storage Allowance: Maximum of a 1:100 AEP 72 hour or a 1 in 100 Wet Year Sequence.
- Freeboard: 1:10 AEP Wind plus 0.5 m.
- Design Spillway Floods: PMF.
- Earthquake: OBE = 1 in 1,000 yr; MDE = 1:10,000 yr.

1.2 CLIMATE DATA

Monthly Data

The climate data used was based on processed rainfall data from Gore and evaporation data from Peens & Associates "Tulu Kapi Tailings Storage Facility Baseline Hydrological Assessment", February 2012. The data are summarised in Table 1.1.

Table 1.1: Monthly Climate Data

Month	Rainfall			Evaporation (Lake equivalent)
	Average	1 in 100 Wet Year	1 in 100 Dry Year	(mm)
January	14.3	17.6	19.0	136
February	42.9	2.5	24.8	155
March	42.9	179.0	20.7	156
April	31.8	36.8	14.9	160
May	155.0	314.5	191.3	140
June	275.0	372.2	192.1	104
July	161.4	384.7	104.3	69
August	290.9	380.6	188.0	65
September	275.0	514.4	214.5	71
October	290.1	215.0	136.6	111
November	86.6	297.8	41.4	121
December	29.4	30.1	51.3	131
Total	1,695.3	2,745.2	1,198.9	1,419

Storm Data

The storm data analysis was based on daily precipitation data from Gore. After removal of errors and outliers in the data the following storm values (Table 1.2) were used.

Table 1.2: Storm Events

Duration	Frequency (Annual Recurrence Interval)				
	10	50	100	500	1,000
6	73	92	101	123	134
12	88	111	122	148	160
24	104	132	144	176	191
72	140	182	200	241	261

For the storm capacity in the TSF a conservative storm rainfall of 300 mm was used (greater than the 1 in 1,000 years / 72 hr event).

1.3 GEOTECHNICAL CONDITIONS

The geotechnical conditions in the TSF and WD area were assessed based on previous investigations and the following conclusions drawn:

- The scope of work comprised drilling of 6 boreholes to depths of between 12 m and 30 m into bedrock, excavation of 58 test pits, and laboratory testing of selected samples.
- The sub-surface profile within the TSF and WD footprints comprises a variable thickness of laterite and saprolite soils overlying bedrock. Minimal depths of soil overburden were encountered in the valley floors, increasing to upwards of 25 m across the basin areas. The soils comprise red brown or orange brown predominantly medium to high plasticity clayey silt. These soils are firm to stiff becoming stiff to hard in consistency with depth and have low in situ permeability. Bedrock comprises very weak to weak weathered Diorite, becoming moderately strong with depth. At the WD site, an intersection of highly weathered, very weak Chlorite Schist was logged in borehole BH-5-03 between 8.2 m and 13.5 m depth as a sheared contact with a basic dyke.
- Monitoring data indicates that groundwater is located at between 2.4 m and 15 m in the TSF and WD area. Test pit excavations in proximity to watercourses encountered groundwater at a depth of approximately 1.0 m to 1.5 m indicating that near to the valley floors the groundwater level will correspond approximately with creek level.
- Laboratory testing data indicates that the near surface soils should not be susceptible to liquefaction.
- Substantial quantities of borrow material may be sourced from the laterite and saprolite clayey silt horizons which are present beneath the basin areas of both facilities. It is recommended that some depth of low permeability soil cover

should be left in place to mitigate potential seepage loss through the upper rock horizons.

- The ground conditions encountered at the proposed TSF and WD embankments should provide competent foundations for the facility embankments.

1.4 TAILINGS CHARACTERISTICS

1.4.1 Physical Characteristics

The following tailings characteristics were assumed for the design:

- Tailings SG 2.8 t/m^3.
- P_{80} 75 microns.
- Slurry %solids 40%.
- Initial Supernatant Release 48%.
- Final Dry Density of Tailings Mass 1.3 t/m^3.

It is recommended that testing to determine the physical behaviour characteristics of the tailings is undertaken in the final design phase.

1.4.2 Geochemical Characteristics

Preliminary geochemical testing was undertaken and the following significant factors determined:

- The tailings has low sulphide content (<0.01%) and thus will be non-acid generating during the operational phase.
- The supernatant and seepage is expected to be neutral to alkaline with elevated concentrations of arsenic, selenium, antimony and molybdenum.
- Post closure potential elevated concentrations of iron and manganese may generate acidity when the seepage flow is exposed to oxygen.

The design conclusions based on the preliminary data are as follows:

- Seepage control measures will be required to limit seepage outflows.
- Storm capacity on the facility will need to be sufficient to provide adequate dilution prior to release.
- A cover will need to be placed over the tailings at closure to limit water and oxygen ingress.

It is recommended that an additional phase of geochemical testing on the tailings is undertaken.

1.5 TAILINGS STORAGE FACILITY DESIGN

1.5.1 Site Selection

A number of valleys within the current mine lease area were examined to assess the tailings storage potential (Figure 1.1). This indicated that the only valley with sufficient storage potential (within the lease boundaries) was the valley to the east of the plant area.

1.5.2 General Description

The facility will be constructed in the valley to the east of the plant site (Figure 1.2). The main embankment will be constructed at the northern end of the valley at a narrow section. The valley has three main branches and the embankment will enclose a total catchment of about 260 ha. In order to maintain the TSF as a 'water negative' facility two water dams (WD1 & WD2) will be constructed upstream of the tailings area. The water dams will divert water around the tailings area and also provide a raw water supply for the plant.

Tailings discharge will occur from the downstream (north) side of the two water dams and the eastern side of the tailings area with the tailings profile sloping down to the decant pond on the western side of the main embankment. The decant return will be pumped back to the plant for reuse in the process. It was assumed that tailings deposition commences in October 2019.

1.5.3 Embankment Construction

The main embankment will be a downstream multi zoned embankment constructed initially out of local borrow with mine waste providing the bulk of the future embankment raises.

The embankment zones will consist of an upstream erosion control layer consisting of a geotextile layer for Stage 1 replaced with rockfill for future stages when it becomes available from the pit; a low permeability (Zone A) upstream zone consisting of selected local borrow materials moisture conditioned and compacted as required to achieve a suitable low permeability and a downstream structural zone consisting of local borrow for Stage 1 and Run of Mine waste for future stages.

The embankment crest will be 8 m wide with an upstream slope of 1V:2.5H and a downstream slope of 1V:3H with nominal 5 m benches at 10 m height intervals (overall slope of 1V:3.5H). The embankment lifts will be a minimum of ~ 2 m height to ensure a downstream working platform width for fill placement of 15 m or more. Stage 1 Embankment Crest has been adjusted to ensure that should the tailings have a flatter slope than the selected design slope (1V:120H) there is sufficient storage capacity available.

The staging of the embankment as presented herein is based on providing 12 months capacity with each construction stage. The storage capacity is suitable if the plant is commissioned in March (allowing for Stage 2 to be constructed between November and February). If the plant is commissioned at any other time of the year then the storage capacity will need to be reviewed and potentially adjusted.

The embankment staging is provided in Table 1.3.

Table 1.3: Embankment Staging

Year	Stage	Tonnage (Mt)	Months of Capacity	Crest RL (RLm)	Lift Height (m)
-1	1	1.43	12	1620.0	~25 m Max
1	2	1.70	12	1625.3	4.1
2	3	1.70	12	1630.0	4.7
3	4	1.7	12	1633.8	3.8
4	5	1.50	12	1637.1	3.2
5	6	1.50	12	1639.7	2.6
6	7	1.50	12	1642.1	2.4
7	8	1.50	12	1644.4	2.2
8	9	1.50	12	1646.3	1.9
9	10	1.36	11	1648.2	1.9
	Total	**15.4**	**Final**	**1648.2**	

The embankment levels given are the minimum height required and it is viable to raise the embankment at a faster rate to suit mine waste production schedules.

To enhance the downstream stability of the embankment, drainage will be provided at the base of the valley from the back of the Zone A to the downstream toe.

1.5.4 Seepage Control

To reduce seepage losses a number of seepage control measures will be incorporated into the TSF design as follows:

- Cutoff Trench – a cutoff trench will be constructed at the end of the Zone A to competent, low permeability foundation material (nominal 2 m depth).
- The base of the TSF area will be scarified and compacted to produce a low permeability soil liner. In areas with unsuitable material or exposed rock suitable material from elsewhere in the basin will be imported to form the low permeability soil liner.
- Underdrainage System – an underdrainage system will be constructed in the area in front of the embankment to drain the base of the tailings adjacent to the

embankment and reduce water driving pressures into the underlying layers. This system will only commence operation when the area is covered by tailings.

- Underdrainage Collection Sump – an underdrainage collection sump will be installed to collect the water from the underdrainage system.
- Decant System – the decant system will be designed and operated to minimise the decant pond as much as practicable.
- Downstream Monitoring Bores – the monitoring bores downstream of the embankment will be constructed so that they can be converted to pump out bores if required.

1.5.5 Decant System

The TSF decant system will be developed in two phases:

- Phase 1 – will operate in Stage 1 when the rate of rise is high and will consist of a floating barge in the decant pond pumping return water back to the plant.
- Phase 2 – will operate from Stage 2 and will consist of a decant tower on the west abutment adjacent to the main embankment. As the supernatant pond increases in elevation, additional towers will be constructed higher up the slope. Each tower will consist of a concrete base and 1.8 m diameter slotted precast concrete pipes. The towers will be surrounded by free draining rockfill. The collected supernatant will be pumped back to the plant. If required a pump booster station could be constructed on the access causeway to the decant tower.

1.5.6 Emergency Spillway

The TSF will be designed to hold the 1 in 100 wet year rainfall runoff and/or a 1 in 100 year 72 hr storm volume. Under nominal operating conditions with the TSF managed in accordance with standard operating procedures the available stormwater storage capacity will be in excess of the design storm volume and no discharge from the TSF is expected.

In the event of an extreme event greater than the design storm any rainfall and supernatant that cannot be stored on the facility will be discharged in a controlled manner via an emergency spillway. The operational spillway will be constructed around the east side of the TSF and will be designed for the PMF event.

A closure spillway will be constructed at the lowest point in the facility through the west abutment ensuring no ponding of rainfall on the facility surface post closure.

1.5.7 Tailings Deposition

The tailings delivery pipeline will be installed across WD1 and WD2 and then around the eastern side of the facility. A total of about 6 to 8 discharge points will be installed. A discharge pipeline will be extended down the valley to the top of the active tailings area. As the tailings extends up the valley the discharge pipeline will be shortened appropriately. This deposition approach will produce a sloping beach profile extending down towards the main embankment. Given the low seismicity of the site (0.02 to 0.05g) it is not anticipated that any tailings liquefaction or slumping will occur.

1.5.8 Stability

The stability analysis has not been redone for the current design. The following points should be noted:

- In the previous DFS with a part downstream / part upstream embankment the stability analysis using site material parameters and a downstream slope of 1V:3H indicated the embankment was stable. The current design is a fully downstream embankment with a flatter overall downstream slope of 1V:3.5H.
- In the previous DFS it was recommended that a drainage system was constructed in the downstream embankment zone to enhance stability. The current design has a downstream drainage system.
- The embankment has been relocated into the narrowest section of the valley. At its current location the 3D effects of the abutments will provide increased stability.

Based on these factors it is considered that the embankment should be inherently stable. A detailed stability analysis will be undertaken as part of the final design.

1.5.9 Dam Break

A dam break analysis is required for the TSF. The local river is about 9 km downstream of the TSF.

The overall slope from the TSF to the river is about 1V:70H. The gradient along the river is about 1V:400 to 450H. Thus it is anticipated that the tailings will flow down to the river as a slurry flow and then deposit along the river in both directions (Figure 1.3). Typically along the flow path directly downstream of the TSF houses are placed on top of the ridges and hills up to 30 to 50 m above the drainage path. Thus many of the dwellings may not be impacted by a dam break flow.

Based on this preliminary assessment about 1 to 10 people may be at risk in a dam break event.

1.5.10 Closure and Rehabilitation

The closure concepts for the facility will depend on the long term geochemical stability of the tailings and the post closure land use.

The tailings surface slopes down to the proposed closure spillway and thus minimal reshaping of the surface is required.

The cover will incorporate a compacted low permeability layer to reduce infiltration and oxygen ingress into the tailings post closure.

The top section of the cover will be designed to meet the post closure land use. For example if the area is to be returned to cropping the cover materials will need to be thick enough to prevent the roots of the crops from reaching the tailings surface. If other potential land uses are proposed the cover will need to be modified appropriately.

1.6 WATER MANAGEMENT

1.6.1 General

The water management around the TSF consists of two components:

- The management of water on the tailings facility; in particular developing a facility water management design that is water negative.
- Supply of raw water for use in the plant.

The overall approach was based on determining the minimum catchment size that would allow the TSF to remain water negative for different tailings areas and diverting the remaining water flows in such a way that the water is available for use in the plant.

1.6.2 TSF Water Balance

1.6.2.1 Catchment Diversion

The first step in the water balance work was to determine the sensitivity of the TSF Water Balance to catchment area. A simple annual water balance using typical parameters was developed and the results are summarised in Table 1.4.

Table 1.4: Maximum Catchment for Water Negative Water Balance

Catchment Area	Tailings Area (ha) at which WB goes Water Positive
Full (Catch = 260.2 ha)	48
With WD1 (Catch = 210.5 ha)	56
With WD2 (Catch = 188.7 ha)	59
With WD1 and WD2 (Catch – 139.0 ha)	66.5

The TSF footprint based on the modelling reaches a maximum of about 58 - 60 ha. So utilising both WD1 and WD2 should be sufficient to maintain a negative water balance.

1.6.2.2 Water Balance – Average Conditions

A monthly water balance was developed incorporating both the TSF and the diversion systems. Under average climatic conditions the pond reaches the minimum pond size in each dry season. The maximum pond size increases each year as the area of tailings expands (Figure 1.4).

The peak volume occurs in the last wet season of the operation where the pond reaches a maximum value of 557,200 m^3.

1.6.2.3 Water balance – 1 in 100 Wet Year

A 1 in 100 wet year was inserted (independently) into the model in each year as shown on Figure 1.4. The modelling indicates the pond increases significantly in the wet year but in the subsequent years returns back to the average pond configuration in approximately two years of average rainfall. The peak volume occurs from a wet sequence over the penultimate wet season of the operation where the pond reaches a maximum value of 1,377, 000 m^3. The embankment levels as listed in Table 1.3 are primarily controlled by the 1 in 100 wet year pond volume as shown on Figure 1.5.

1.6.3 Water Storage and Diversion

1.6.3.1 Water Diversion

As shown on Figure 1.2 the area upstream of the TSF catchment area will be diverted. This will be achieved by constructing two water dams in the two valleys to the east of the plant site. Water Dam 1 (WD1) is in the valley directly below the plant site area. This storage will provide water back to the plant. Water Dam 2 (WD2) is in the next valley to the east.

Associated with the two water dams are three diversion channels:

- Diversion Channel 1 (DC1) from WD1 northwards along the ridgeline from the water management area.
- Diversion Channel 2 (DC2) from WD2 to WD1 – overflow water from WD2 will flow along the channel to WD1.
- Diversion Channel 3 (DC3) east of WD2 directing runoff from the upper east catchment into WD2.

Operationally water will be pumped from WD1 to the plant to provide the raw water supply. Water will be pumped from WD2 to WD1 each dry season (nominally up to 50,000 m^3/month) to provide water in WD1 to supply the plant water demand. It is necessary to build the water dams and diversion system in advance of commissioning in order to accumulate sufficient water for startup. In order to prevent a shortfall under average conditions in Year 1 the two water dams needs to be constructed early enough to capture one wet season prior to commissioning. Based on a plant commissioning date of March 2020 the water dams would need to be operational in March 2019. Should a 1 in 100 dry year condition occur in Year 1 the plant will have a total shortfall of approximately 100,000m^2 between months 11 and 12 of Year 1.

1.6.4 Water Dams

The water dams will both be downstream multi zoned embankments with a 10 m wide crest and upstream and downstream slopes of 1V:3H. The embankment zones will consist of an upstream erosion control layer which will be durable waste rock of a suitable size; an upstream low permeability zone (Zone A) to reduce seepage through to the TSF area and a downstream structural zone (Zone C). The material for constructing the two water dams will be won from local borrow. If suitable durable waste rock is not available economically, HDPE could be used as an upstream face erosion control system. Table 1.5 provides design data for the two water dams.

Table 1.5: Water Dams

Dam	WD1	WD2
Catchment (ha)	49.7	105.1*
Height (m)	27	20
Storage Capacity (Mm^3)	0.58	0.332
Nominal Embankment Fill (m^3)	130,000	85,000

* Includes area from Diversion Channel 3

It is recommended that the downstream faces of the water dams are vegetated to reduce erosion and sediment loss.

1.6.5 Diversion Channels

The diversion channels are designed based on diverting the bulk of the rainfall runoff from the upstream catchment and transferring water from water dam to water dam. The channels will have a base width of 2 m and be a minimum of 0.8 m deep giving a maximum flow rate of 4 m^3/s or up to 300,000 m^3/day.

For storm events that result in flow larger than these the diversion channels will be designed to overflow into the TSF area. Similarly both water dams will have emergency spillways to discharge into the TSF to prevent overtopping of the water dam embankment.

1.6.6 Water Supply

The two water dams are insufficient to supply the full plant water demand under both average and 1 in 100 dry year climatic conditions. The model was run with an external bore input based on the bore running for six months during the dry season (December to May) each year. Table 1.6 summarises the bore input requirements.

Table 1.6: Bore Input Flows

Climatic Conditions	Bore Supply Rate (L/s)	Shortfall Years
Average	8.50	2 to 5
1 in 100 Dry Year		2 to 5
Year -1	9.63	2 to 5
Year 1	12.54	1 to 5
Year 2	15.47	2 to 5
Year 3	17.31	2 to 5
Year 4	15.13	2 to 5
Year 5	11.98	2 to 6
Year 6	9.58	2 to 7

A minimum bore inflow rate (assumed to be pumped into WD1) of 8.5 L/s will be required to prevent shortfalls under average climatic conditions increasing to a supply rate of 17.3 L/s for 1 in 100 dry year climatic conditions.

1.7 SEDIMENT CONTROL

The design of the TSF and water management system provide a high level of sediment control in the existing structures as follows:

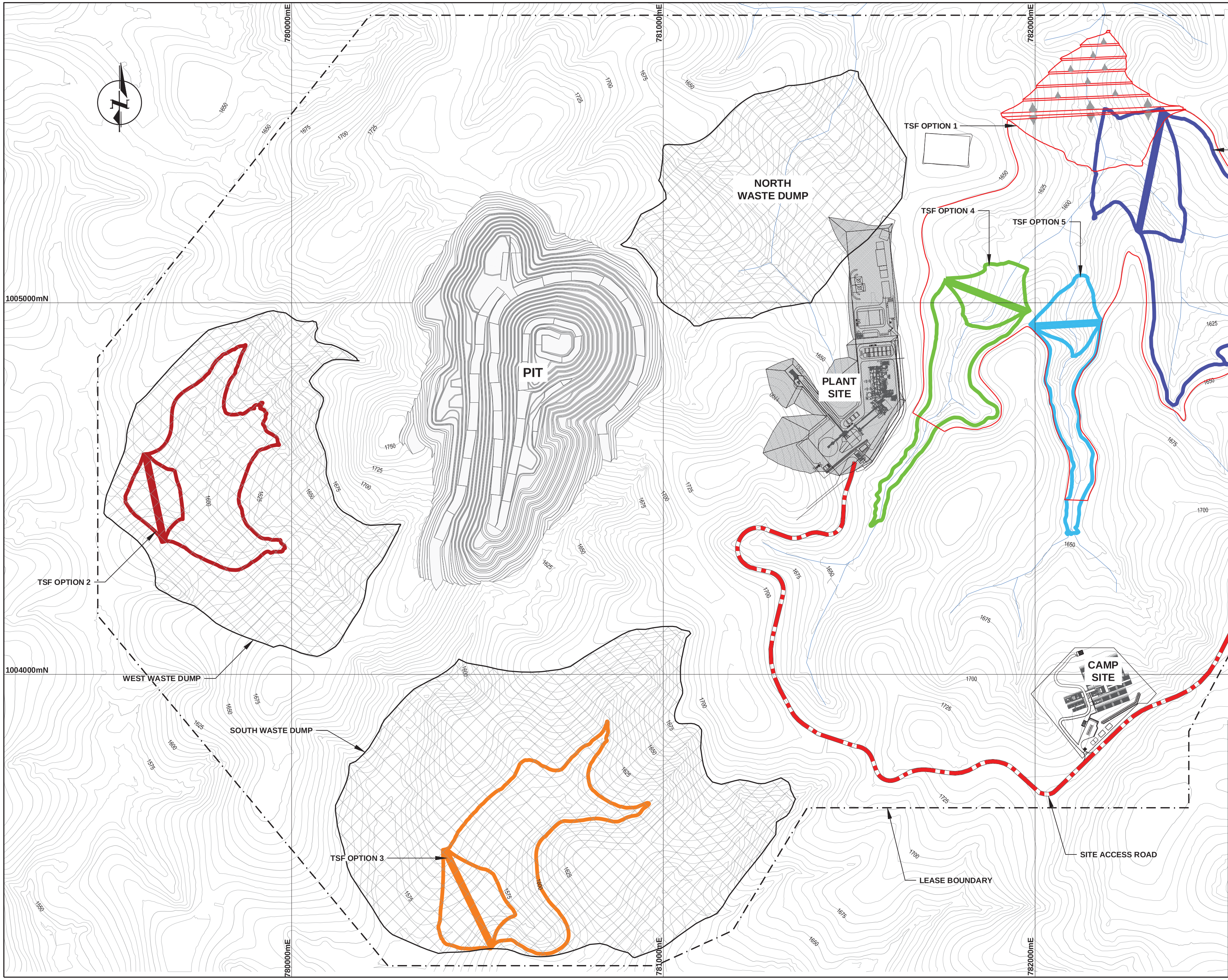
- The water dams will act as sediment traps for the upstream catchments.
- The TSF will act as a sediment trap for flows off the water dam embankments and areas to the south of the water dams.

A sediment control pond will be constructed downstream of the TSF embankment to capture sediment generated by runoff from the embankment. In later stages the downstream section of the embankment will be constructed of waste rock and the sediment control requirements will be reduced.

1.8 EXTERNAL WATER SOURCES

The construction of the water dams in advance of commissioning will potentially result in sufficient water availability for the plant raw water needs for Year 1 depending on the climatic conditions at the site. Water demands for dust control or pit operations will need to be supplied from other sources.

FIGURES



ITEM DETAILS

ITEM	EMBANKMENT FILL VOLUME (m^3)	POTENTIAL STORAGE VOLUME (m^3)
TSF OPTION 1	1,890,000	10,600,000
TSF OPTION 2	194,000	1,162,000
TSF OPTION 3	409,500	1,510,500
TSF OPTION 4	733,500	624,000
TSF OPTION 5	282,000	306,500
TSF OPTION 6	883,000	2,800,000

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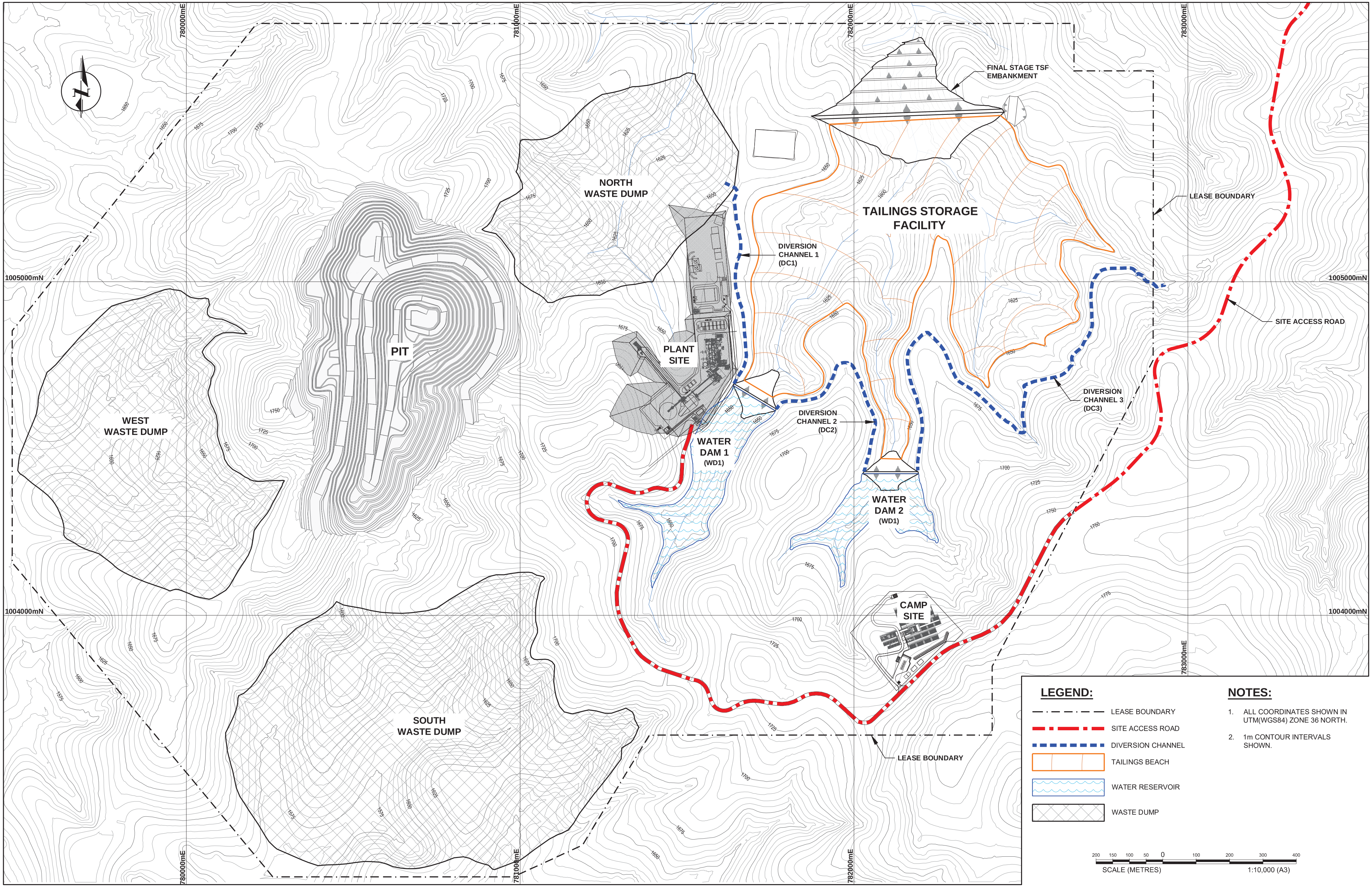
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY AND WATER MANAGEMENT SYSTEM
POTENTIAL STORAGE OPTIONS

Ref: PE402-00012/02
Figure 1.1



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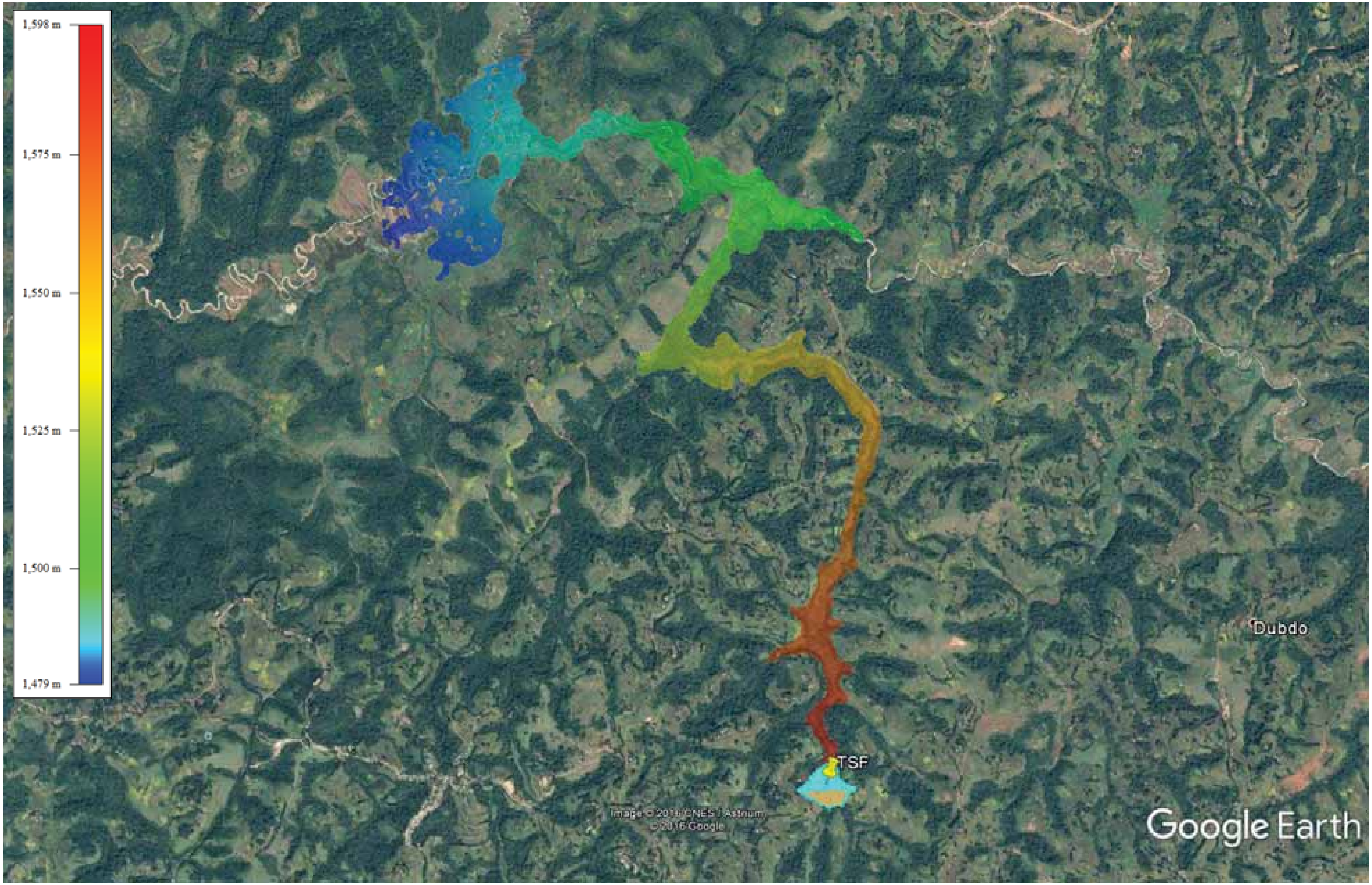
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY AND WATER MANAGEMENT SYSTEM
SITE GENERAL ARRANGEMENT

Ref: PE402-00012/02
Figure 1.2



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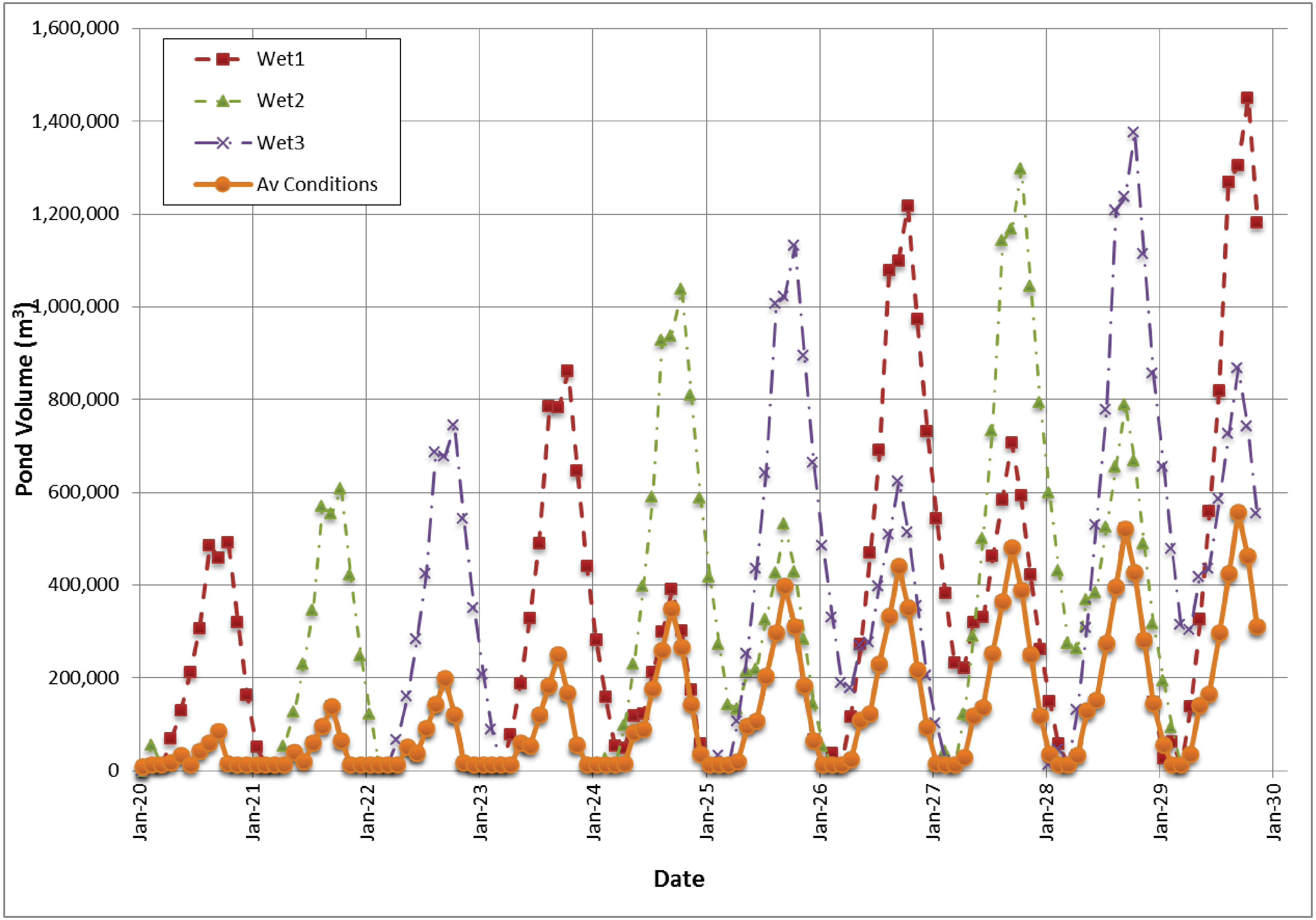
TULU KAPI GOLD PROJECT
DAM BREAK ASSESSMENT
MAIN EMBANKMENT BREACH

Ref: PE402-00012/03
Figure 1.3



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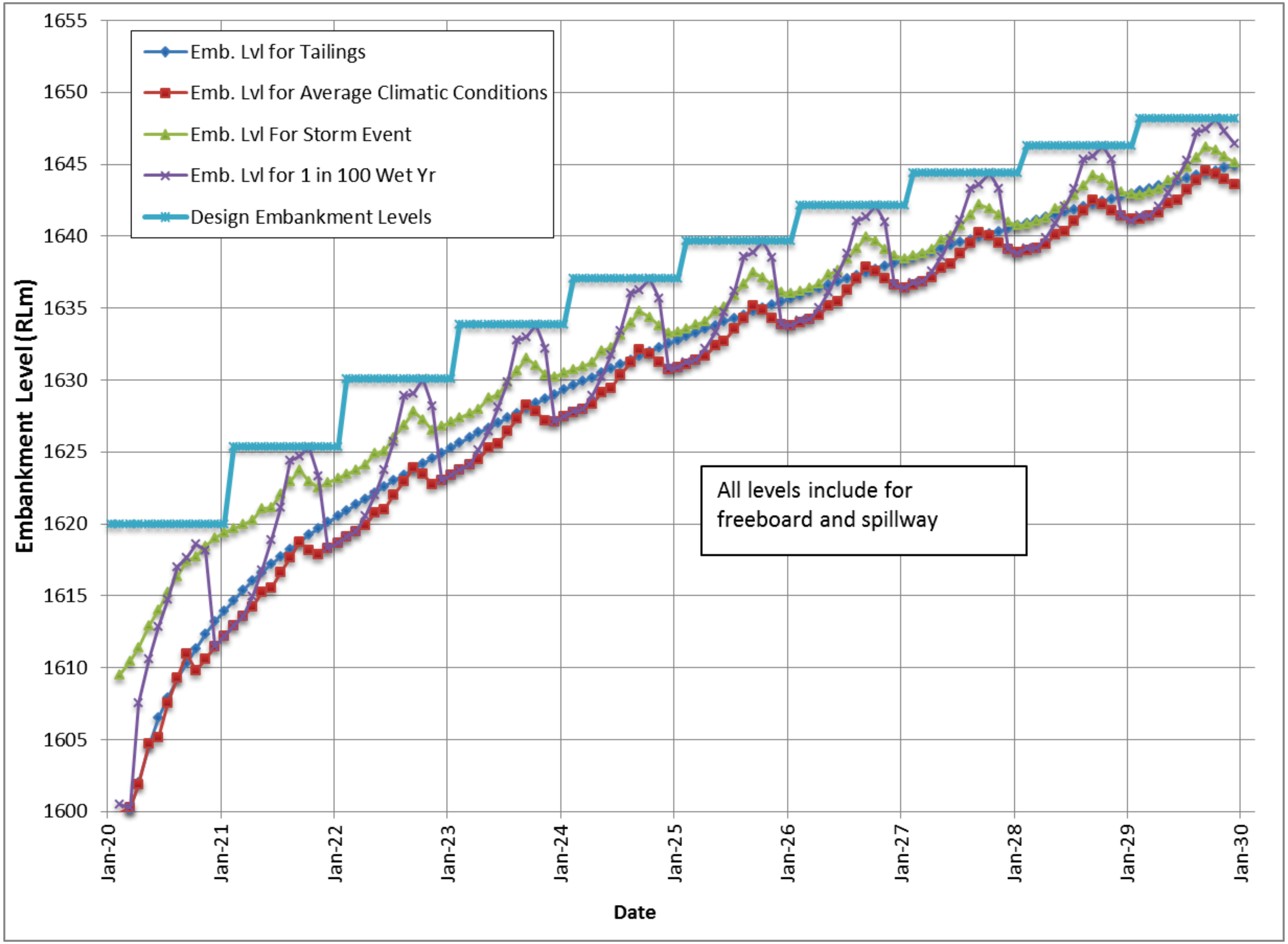
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY AND WATER MANAGEMENT SYSTEM
AVERAGE CLIMATE CONDITIONS PLUS 1 IN 100 WET YEAR EVENTS

PE402-00012/02
Figure 1.4



Emb. Lvl for Tailings
Emb. Lvl for Average Climatic Conditions
Emb. Lvl For Storm Event
Emb. Lvl for 1 in 100 Wet Yr
Design Embankment Levels
All levels include for freeboard and spillway
Embankment Level (RLm)
1655
1650
1645
1640
1635
1630
1625
1620
1615
1610
1605
1600
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25
Jan-26
Jan-27
Jan-28
Jan-29
Jan-30
Date

APPENDIX 7.2

TSF AND WATER DAM - DESIGN

TULU KAPI GOLD PROJECT

TAILINGS STORAGE FACILITY WATER STORAGE DAM AND SURFACE WATER MANAGEMENT

FEASIBILITY STUDY

Prepared for:

KEFI MINERALS PLC

Prepared by:

Knight Piésold CONSULTING

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A.C.N. 001 040 419

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Level 1, 184 Adelaide Terrace
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AUSTRALIA

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DRAFT
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TSF, WSD AND SWM
TITLE PAGE

SCALE N.T.S.
STATUS FS
DRAWING NUMBER 402-012-B001-001
REV A

REVISIONS

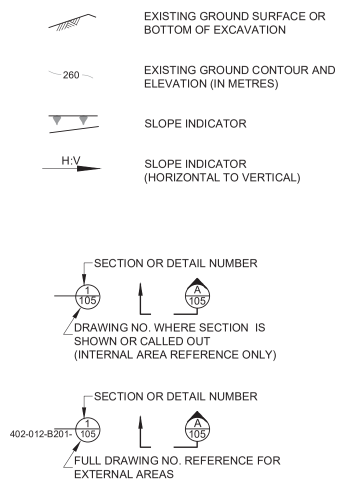
REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

SHEET SIZE A3

REFERENCES

DRAWING No.	DRAWING TITLE

COMMON LEGEND



ABBREVIATIONS

C.M.	CONSTRUCTION MANAGER
N.T.S.	NOT TO SCALE
APPROX. ≈	APPROXIMATELY
BOP	BOTTOM OF PIPE
℄	CENTRELINE
CPT	CORRUGATED POLYETHYLENE TUBING
DIA. Ø	DIAMETER
ELEV	ELEVATION
HLF	HEAP LEACH FACILITY
HDPE	HIGH DENSITY POLYETHYLENE
ID	INSIDE DIAMETER
IL	INVERT LEVEL
LCRS	LEACHATE COLLECTION & REMOVAL SYSTEM
LLDPE	LINEAR LOW DENSITY POLYETHYLENE
MH	MANHOLE
MAX	MAXIMUM
MIN	MINIMUM
MMDD	MAXIMUM MODIFIED DRY DENSITY
NOM	NOMINAL
OD	OUTSIDE DIAMETER
OMC	OPTIMUM MOISTURE CONTENT
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PT	POINT OF TANGENT
PVC	POLYVINYL CHLORIDE
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
REQ'D	REQUIRED
R.L.	REDUCED LEVEL
SDR	STANDARD DIMENSIONAL RATIO
SCH	SCHEDULE
SMDD	STANDARD MAXIMUM DRY DENSITY
SOL	SETTING OUT LINE
SOP	SETTING OUT POINT
IWL	INTEGRATED WASTE LANDFORM
TYP	TYPICAL

INDEX OF DRAWINGS

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SITE OVERVIEW	A	402-012-B001-050
SITE GENERAL ARRANGEMENT	A	402-012-B201-100
STAGE 1 GENERAL ARRANGEMENT	A	402-012-B201-101
STAGE 10 GENERAL ARRANGEMENT (FINAL)	A	402-012-B201-110
EMBANKMENT SECTIONS AND DETAILS - SHEET 1	A	402-012-B201-301
EMBANKMENT SECTIONS AND DETAILS - SHEET 2	A	402-012-B201-302
EMBANKMENT SECTIONS AND DETAILS - SHEET 3	A	402-012-B201-303
EMBANKMENT SECTIONS AND DETAILS - SHEET 4	A	402-012-B201-304
STAGE 10 UNDERDRAINAGE LAYOUT	A	402-012-B201-510
UNDERDRAINAGE SECTIONS AND DETAILS - SHEET 1	A	402-012-B201-551
UNDERDRAINAGE SECTIONS AND DETAILS - SHEET 2	A	402-012-B201-552
MONITORING INSTRUMENTATION LAYOUT	A	402-012-B201-900
MONITORING INSTRUMENTATION DETAILS	A	402-012-B201-905
WATER STORAGE DAM		
GENERAL ARRANGEMENT	A	402-012-B401-101
TYPICAL SECTIONS AND DETAILS	A	402-012-B401-121
SURFACE WATER MANAGEMENT		
TYPICAL SECTIONS AND DETAILS	A	402-012-B501-301

GENERAL NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. ALL COORDINATES STATED IN UTM (WGS84) ZONE 37 SOUTH.
3. ALL ELEVATIONS IN METRES, RELATIVE TO MEAN SEA LEVEL.
4. DRAWINGS ARE NOT TO BE SCALED.
5. DRAWINGS TO BE READ IN CONJUNCTION WITH THE TECHNICAL SPECIFICATIONS.

NOT FOR CONSTRUCTION

DRAFT
ORIGINAL STAMPED IN RED

REFERENCES	
DRAWING No.	DRAWING TITLE

REVISIONS							
REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

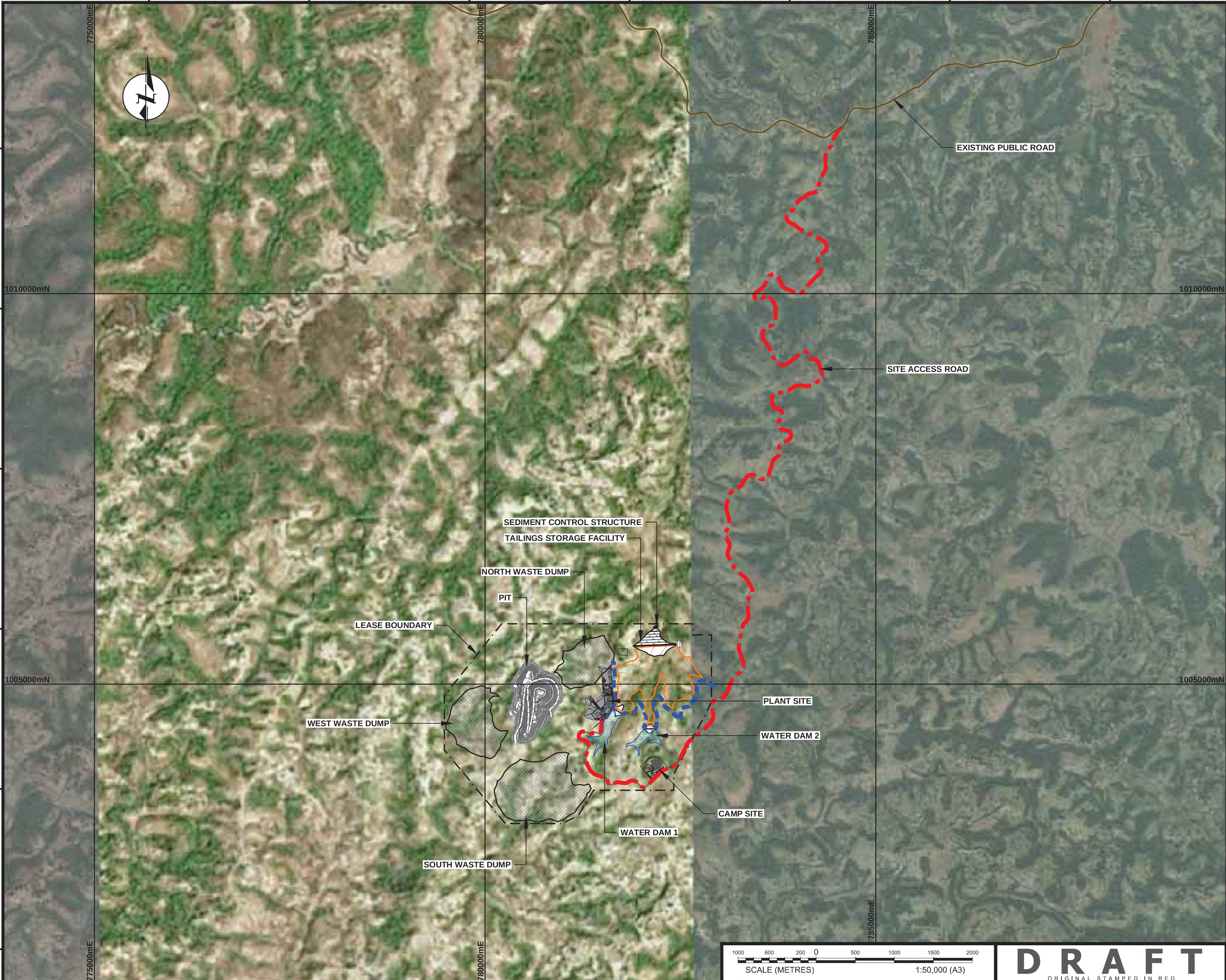
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TSF, WSD AND SWM
INDEX, ABBREVIATIONS AND COMMON LEGEND

SCALE N.T.S.
STATUS FS
DRAWING NUMBER 402-012-B001-002
REV A

SHEET SIZE A3

287 410



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD

NOTES:

1. ALL COORDINATES SHOWN IN UTM(WGS84) ZONE 36 NORTH.
2. BACKGROUND IMAGE COURTESY OF DIGITAL GLOBE, GEO EYE EARTHSTAR AND MICROSOFT CORPORATION, 2017.

NOT FOR CONSTRUCTION

SCALE (METRES) 1000 600 200 0 500 1000 1500 2000 — 1:50,000 (A3)

DRAFT
ORIGINAL STAMPED IN RED

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

DRAWING No.	DRAWING TITLE

REFERENCES

SHEET SIZE A3

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

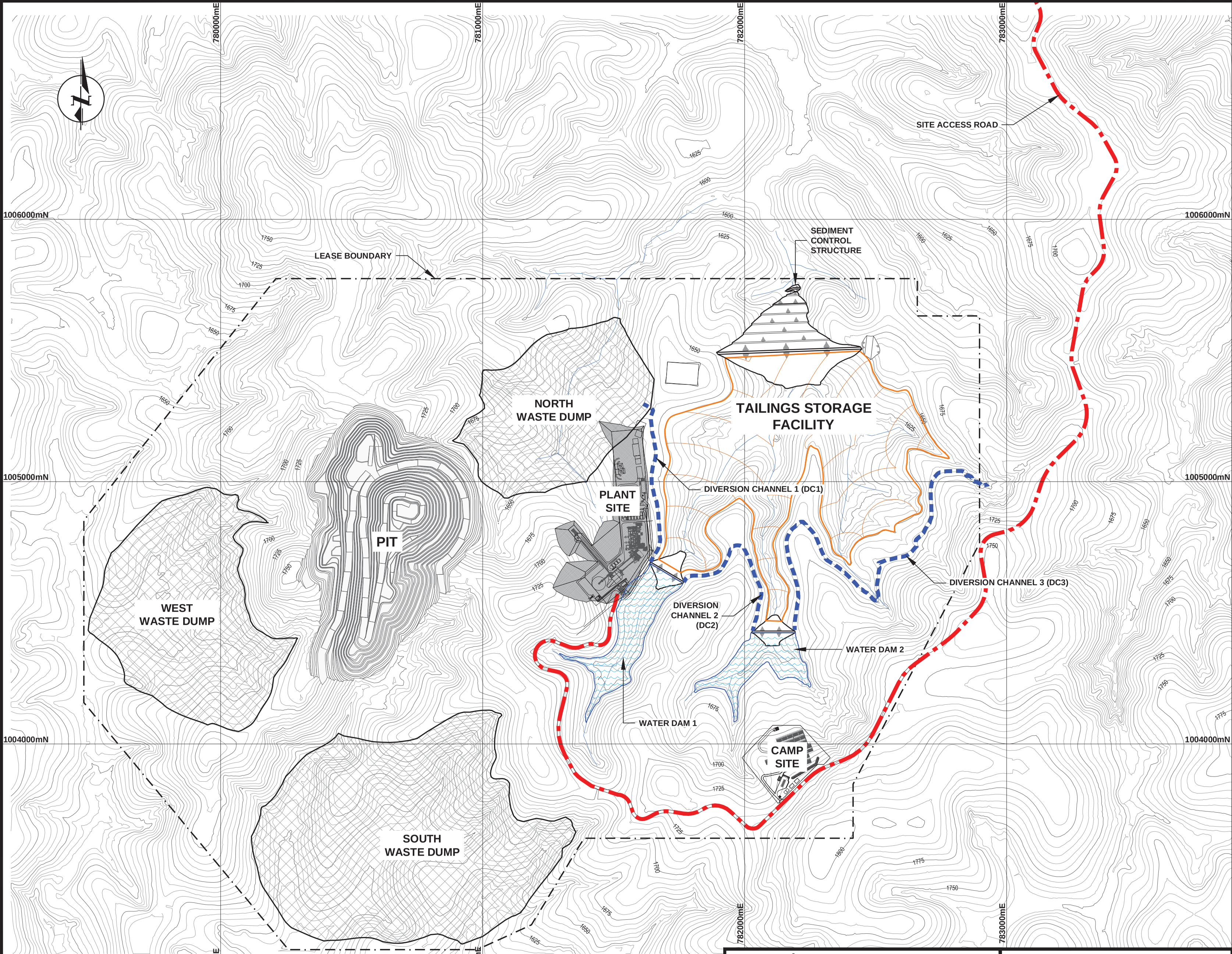
Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TSF, WSD AND SWM
SITE OVERVIEW

SCALE 1:50,000
STATUS FS
DRAWING NUMBER 402-012-B201-050
REV A



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD

NOTES:

1. 5m CONTOUR INTERVALS SHOWN.
2. FINAL TAILINGS STORAGE FACILITY LAYOUT SHOWN.

NOT FOR CONSTRUCTION

DRAFT

ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

DRAWING No.	DRAWING TITLE

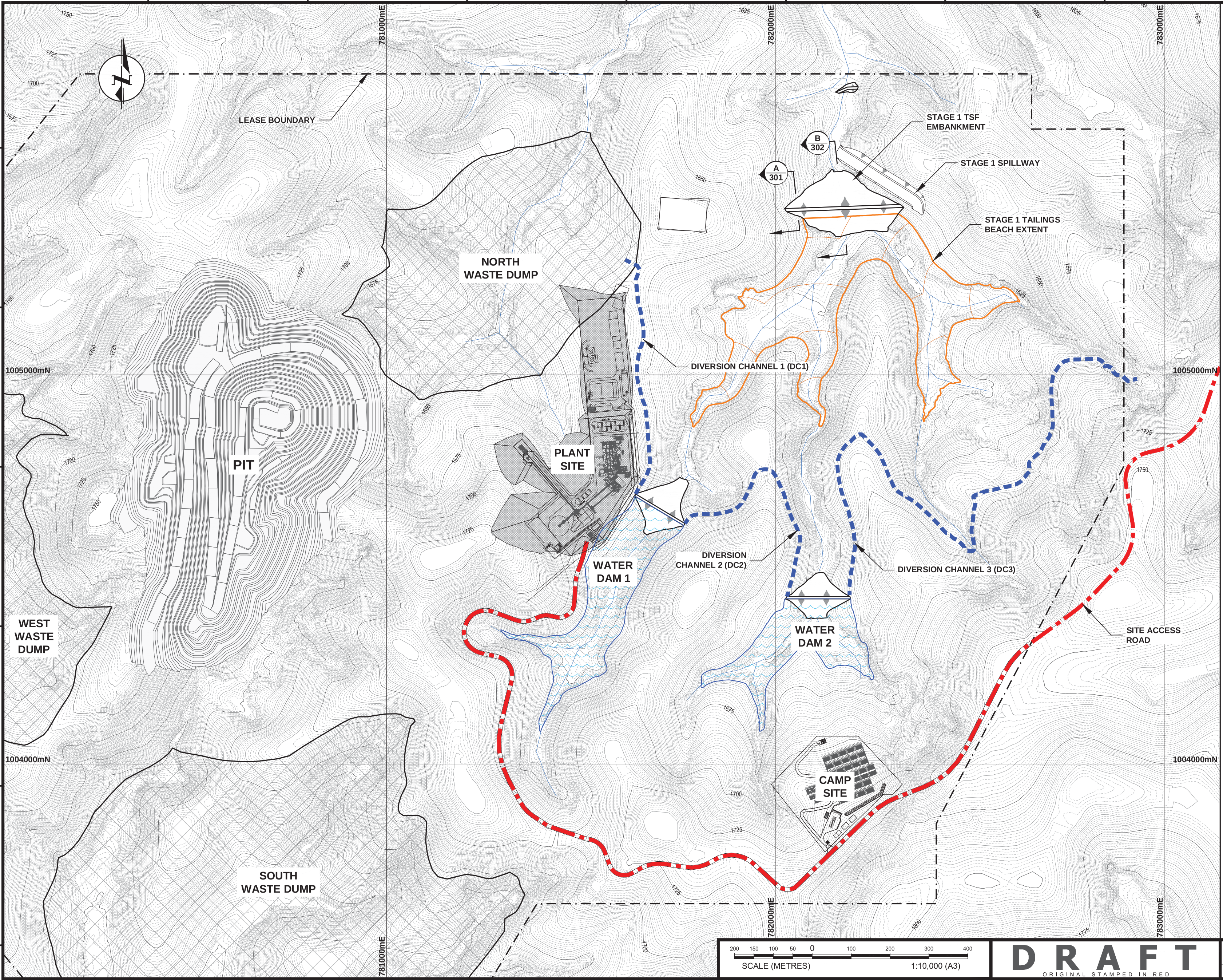
REFERENCES

SHEET SIZE A3

Knight Piésold CONSULTING

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
SITE GENERAL ARRANGEMENT

SCALE 1:15,000
STATUS FS
DRAWING NUMBER 402-012-B201-100
REV A



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD

NOTES:

1. 1m CONTOUR INTERVALS SHOWN.
2. STAGE 1 TAILINGS STORAGE FACILITY LAYOUT SHOWN.

NOT FOR CONSTRUCTION

SCALE (METRES) 200 150 100 50 0 100 200 300 400 — 1:10,000 (A3)

DRAFT — ORIGINAL STAMPED IN RED

REFERENCES	
DRAWING No.	DRAWING TITLE
402-012-B201-301	EMBANKMENT SECTIONS & DETAILS-SHEET 1
402-012-B201-302	EMBANKMENT SECTIONS & DETAILS-SHEET 2

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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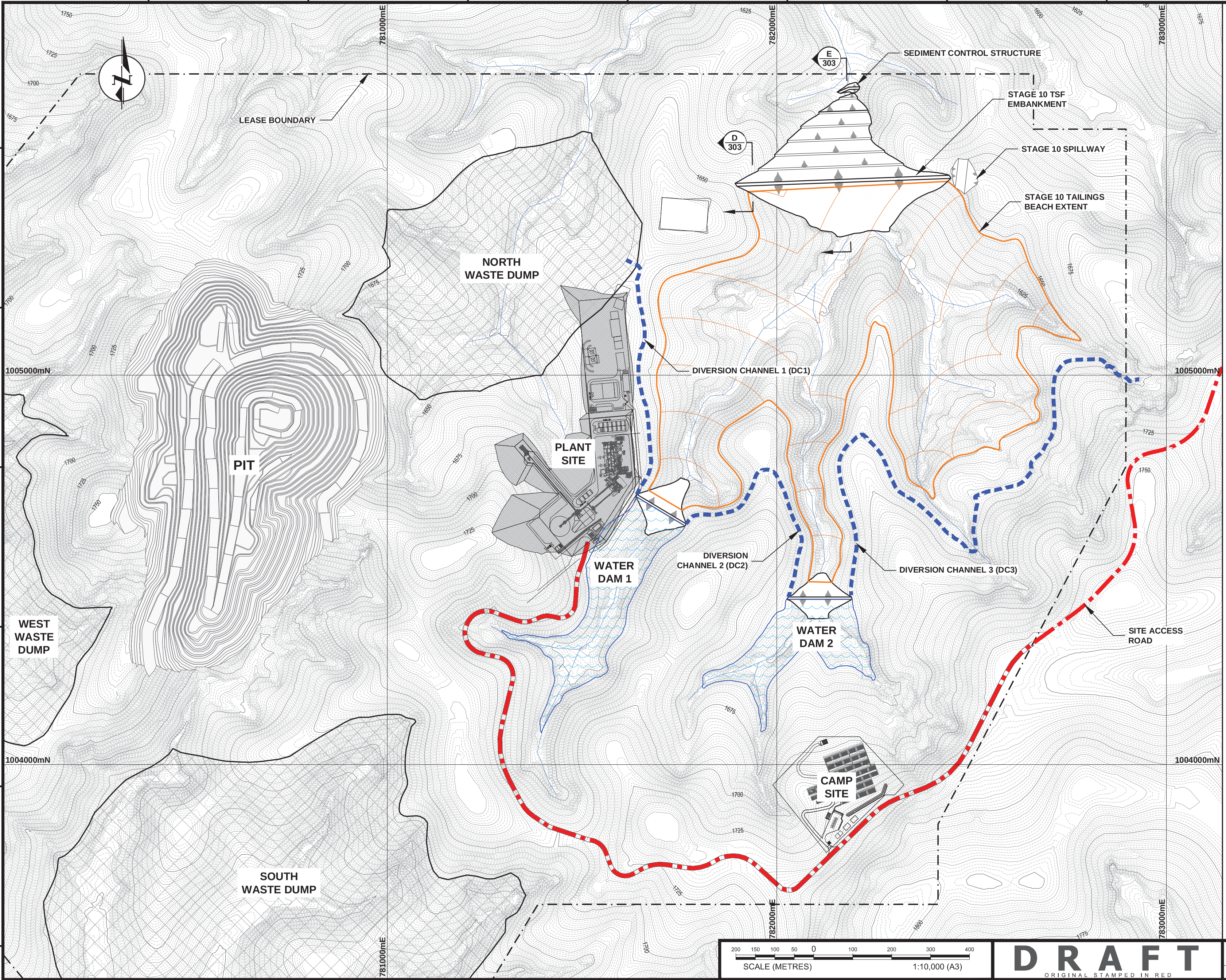
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
STAGE 1 GENERAL ARRANGEMENT

SCALE 1:10,000
STATUS FS
DRAWING NUMBER 402-012-B201-101
REV A

SHEET SIZE A3

287
410



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD

NOTES:

1. 1m CONTOUR INTERVALS SHOWN.
2. FINAL TAILINGS STORAGE FACILITY LAYOUT SHOWN.

NOT FOR CONSTRUCTION

SCALE (METRES) 200 150 100 50 0 100 200 300 400 — 1:10,000 (A3)

DRAFT
ORIGINAL STAMPED IN RED

DRAWING No.	DRAWING TITLE
402-012-B201-303	EMBANKMENT SECTIONS & DETAILS-SHEET 3

REFERENCES — SHEET SIZE A3

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
STAGE 9/10 GENERAL ARRANGEMENT (FINAL)

SCALE 1:10,000
STATUS FS
DRAWING NUMBER 402-012-B201-110
REV A

TABLE No.1
SOIL SPECIFICATION SUMMARY

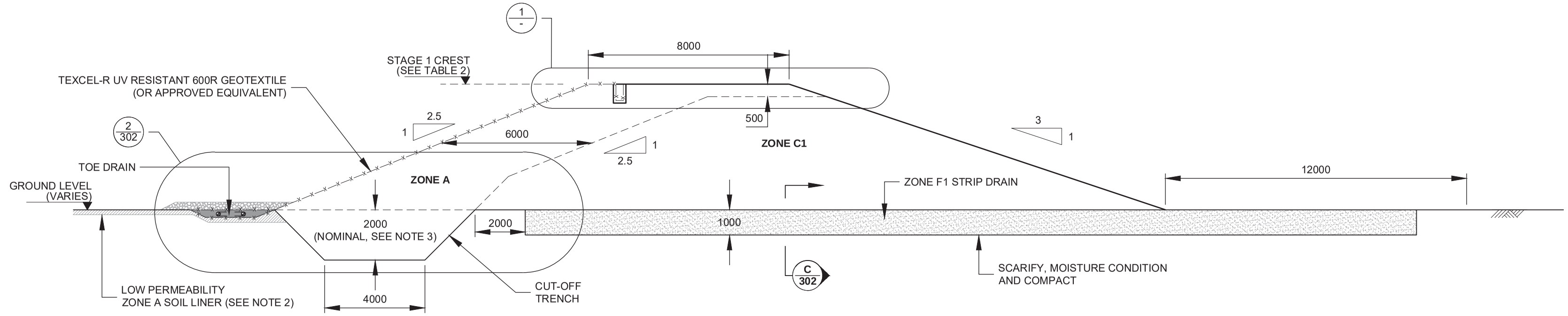
ZONE TYPE	ZONE DESCRIPTION	MAXIMUM LAYER THICKNESS	COMPACTION SPECIFICATION	GRADING
ZONE A	LOW PERMEABILITY MATERIAL	300mm	98% SMDD -1% <OMC < +3%	D_{max} = 75mm % FINES > 40 PI $_{fines}$ > 12
ZONE B	TRANSITION ZONE	300mm	95% SMDD -2% <OMC < +2%	T.B.C.
ZONE C1	STRUCTURAL FILL (PLACED BY CIVIL CONTRACTOR)	300mm	95% SMDD -2% <OMC < +2%	D_{max} = 200mm
ZONE C2	STRUCTURAL FILL (DELIVERED BY MINING & PLACED BY CIVIL)	500mm	6 PASSED 12T COMPACTOR	D_{max} = 350mm
ZONE D	GENERAL FILL	500mm	92% SMDD	D_{max} = 300mm
ZONE E	EROSION PROTECTION	N/A	COMPACTED WITH EXCAVATOR BUCKET	D_{max} = 300mm % FINES < 5
ZONE F1	SAND DRAINAGE MEDIUM	N/A	UNIFORM DENSITY FREE FROM CAVITIES	D_{max} = 19mm % FINES < 5
ZONE F2	GRAVEL DRAINAGE MEDIUM	N/A	UNIFORM DENSITY FREE FROM CAVITIES	D_{max} = 75mm % FINES < 5
ZONE G	CLEAN SELECTED ROCKFILL	N/A	UNIFORM DENSITY FREE FROM CAVITIES	D_{max} = 500mm % FINES < 5 D_{avg} = 50mm
CUT-OFF TRENCH	LOW PERMEABILITY MATERIAL	300mm	98% SMDD 0% <OMC < +3%	D_{max} = 75mm % FINES > 40 PI $_{fines}$ > 12
CUT-OFF TRENCH BASE	IN-SITU MATERIAL AS APPROVED BY THE ENGINEER	200mm	6 PASSED 12T COMPACTOR	-
EMBANKMENT FOUNDATION	IN-SITU MATERIAL AS APPROVED BY THE ENGINEER	N/A	95% SMDD -1% <OMC < +3%	-
WEARING COURSE	SELECTED LATERITE GRAVEL	N/A	95% SMDD -0% <OMC < +3%	D_{max} = 37.5mm % FINES > 10 PI $_{fines}$ < 10

TABLE No.2
TAILINGS STORAGE FACILITY

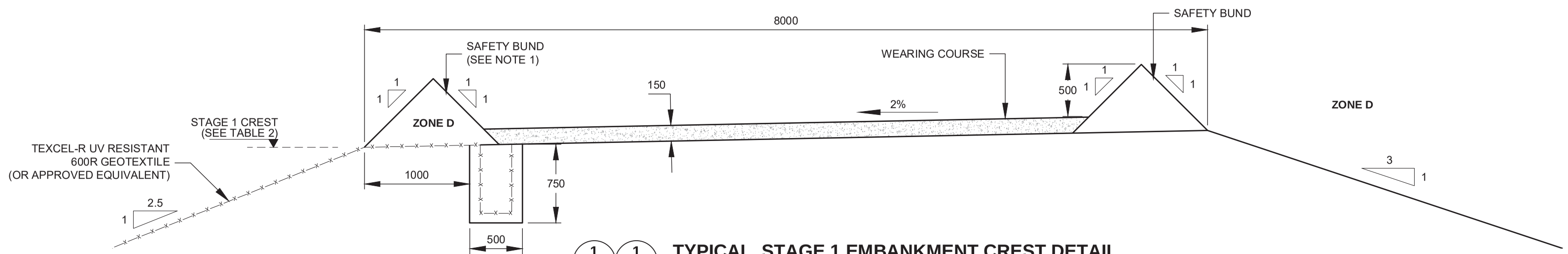
STAGING	CREST HEIGHT R.L. (m)	MAXIMUM EMBANKMENT HEIGHT (m)
1	1620.2	≈25.0
2	1625.3	≈30.3
3	1630.0	≈35.0
4	1633.8	≈38.8
5	1637.1	≈42.1
6	1639.7	≈44.7
7	1642.1	≈47.1
8	1644.4	≈49.4
9	1646.3	≈51.3
10 (FINAL)	1648.2	≈53.2

NOTES:

1. BREAKS IN SAFETY BUND AT 50m CENTRES (TO ALLOW DRAINAGE OF RAINFALL RUNOFF).
2. LOW PERMEABILITY SOIL LINER (ZONE A) IN TSF BASIN AREA AS FOLLOWS:
   - WHERE IN-SITU MATERIAL IS SUITABLE AS SOIL LINER:
     - RE-WORK TO COMPACT TO 200mm DEPTH.
   - WHERE IN-SITU MATERIAL IS UNSUITABLE AS SOIL LINER:
     - 300mm IMPORTED LOW PERMEABILITY SOIL.
3. CUT-OFF TRENCH TO BE EXCAVATED 1m (MIN.) INTO SUITABLE COMPETENT MATERIAL AS DETERMINED BY THE ENGINEER.



A
101
TYPICAL STAGE 1 STARTER EMBANKMENT SECTION
1:200



1
-
1
302
TYPICAL STAGE 1 EMBANKMENT CREST DETAIL
1:50

NOT FOR CONSTRUCTION

REFERENCES	
402-012-B201-101	STAGE 1 GENERAL ARRANGEMENT
402-012-B201-302	EMBANKMENT SECTIONS AND DETAILS - SHEET 2
DRAWING No.	DRAWING TITLE

SHEET SIZE A3

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

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DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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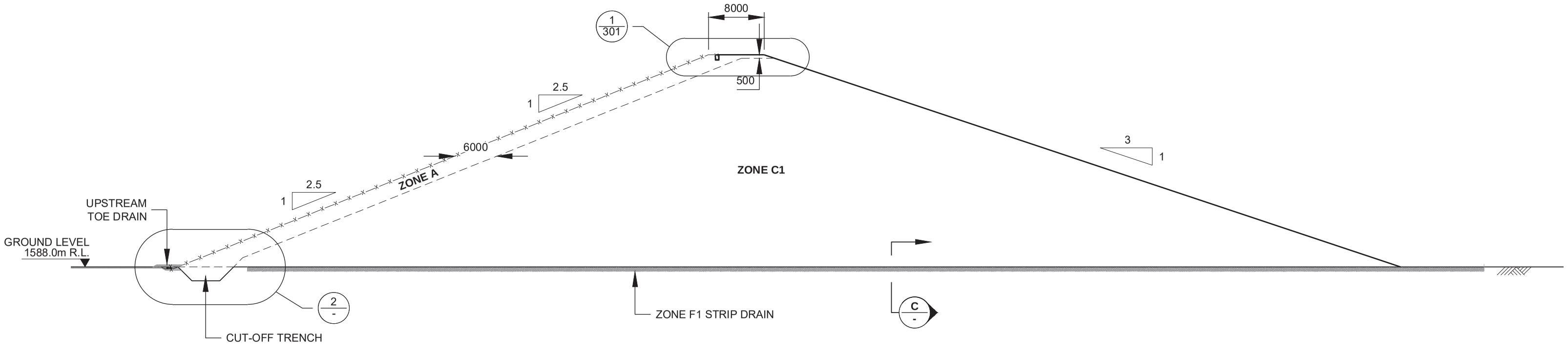
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
EMBANKMENT SECTIONS AND DETAILS - SHEET 1

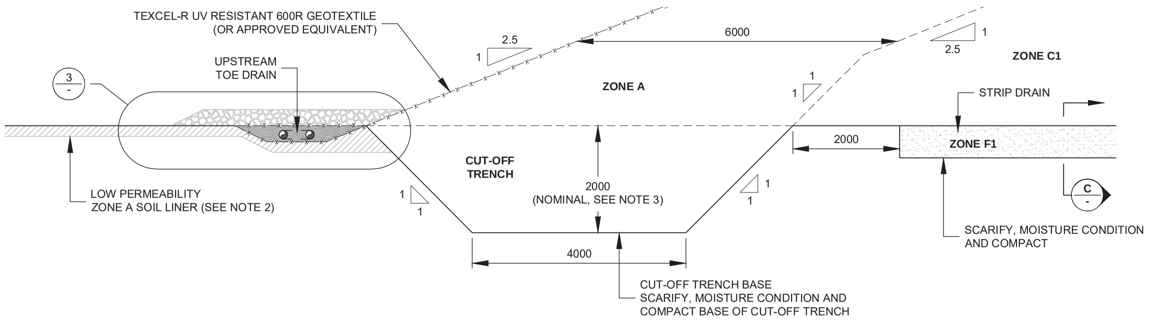
SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-301
REV A

287 410

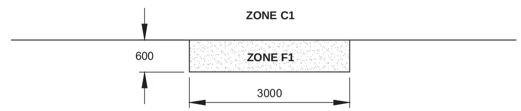
N O T   F O R   C O N S T R U C T I O N



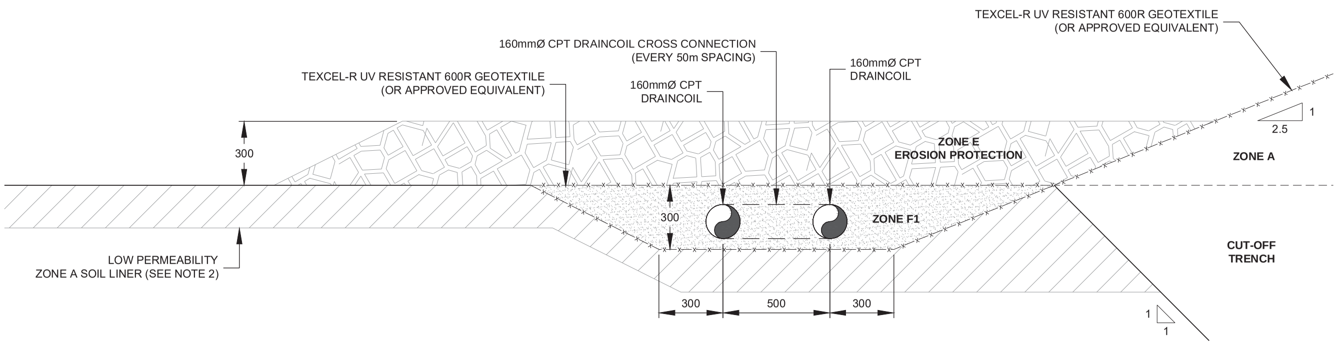
B / 101 **TYPICAL STAGE 1 EMBANKMENT SECTION (AT VALLEY LOW POINT)**
1:750



2 / - 2 / 301 **TYPICAL STAGE 1 CUT-OFF TRENCH DETAIL**
1:100



C / - C / 301 C / 303 C / 304 **TYPICAL EMBANKMENT STRIP DRAIN SECTION**
1:100



3 / - **TYPICAL STAGE 1 UPSTREAM TOE DRAIN DETAIL**
1:25

NOTES:

1. LOW PERMEABILITY SOIL LINER (ZONE A) IN TSF BASIN AREA AS FOLLOWS:
   - WHERE IN-SITU MATERIAL IS SUITABLE AS SOIL LINER:
     - RE-WORK TO COMPACT TO 200mm DEPTH.
   - WHERE IN-SITU MATERIAL IS UNSUITABLE AS SOIL LINER:
     - 300mm IMPORTED LOW PERMEABILITY SOIL.
3. CUT-OFF TRENCH TO BE EXCAVATED 1m (MIN.) INTO SUITABLE COMPETENT MATERIAL AS DETERMINED BY THE ENGINEER.
4. FOR ZONE SPECIFICATION DETAILS REFER TABLE 1 ON DRAWING 402-012-B201-301.

REFERENCES

DRAWING No.	DRAWING TITLE
402-012-B201-101	STAGE 1 GENERAL ARRANGEMENT
402-012-B201-301	EMBANKMENT SECTIONS AND DETAILS - SHEET 1
402-012-B201-303	EMBANKMENT SECTIONS AND DETAILS - SHEET 3
402-012-B201-304	EMBANKMENT SECTIONS AND DETAILS - SHEET 4

REVISIONS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

SHEET SIZE A3

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ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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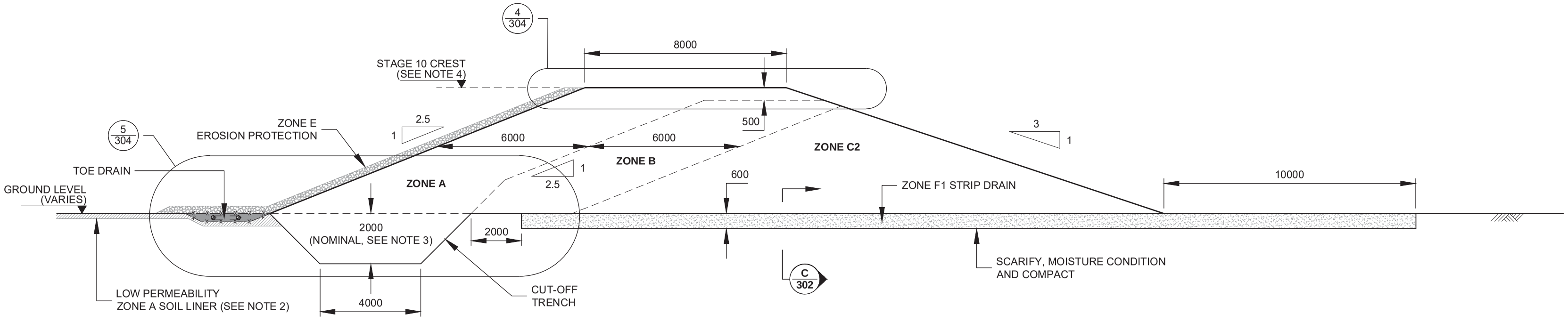
THIRD ANGLE PROJECTION

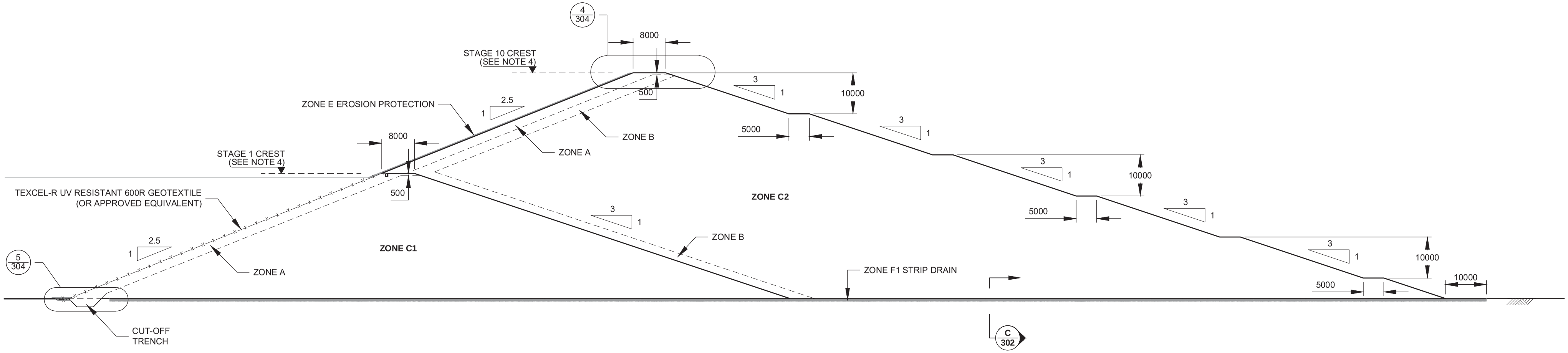
KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
EMBANKMENT SECTIONS AND DETAILS - SHEET 2

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER **402-012-B201-302**
REV **A**

287
410



D
110
TYPICAL STAGE 10 STARTER EMBANKMENT SECTION
1:200



E
110
TYPICAL STAGE 10 EMBANKMENT SECTION (AT VALLEY LOW POINT)
1:1,000

NOTES:

1. LOW PERMEABILITY SOIL LINER (ZONE A) IN TSF BASIN AREA AS FOLLOWS:
   - WHERE IN-SITU MATERIAL IS SUITABLE AS SOIL LINER: - RE-WORK TO COMPACT TO 200mm DEPTH.
   - WHERE IN-SITU MATERIAL IS UNSUITABLE AS SOIL LINER: - 300mm IMPORTED LOW PERMEABILITY SOIL.
2. CUT-OFF TRENCH TO BE EXCAVATED 1m (MIN.) INTO SUITABLE COMPETENT MATERIAL AS DETERMINED BY THE ENGINEER.
3. FOR ZONE SPECIFICATION DETAILS REFER TABLE 1 ON DRAWING 402-012-B201-301.
4. FOR EMBANKMENT CREST LEVELS REFER TABLE 2 ON DRAWING 402-012-B201-301.

NOT FOR CONSTRUCTION

REFERENCES

DRAWING No.	DRAWING TITLE
402-012-B201-110	STAGE 10 GENERAL ARRANGEMENT (FINAL)
402-012-B201-301	EMBANKMENT SECTIONS AND DETAILS - SHEET 1
402-012-B201-302	EMBANKMENT SECTIONS AND DETAILS - SHEET 2
402-012-B201-304	EMBANKMENT SECTIONS AND DETAILS - SHEET 4

REVISIONS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

DRAFT
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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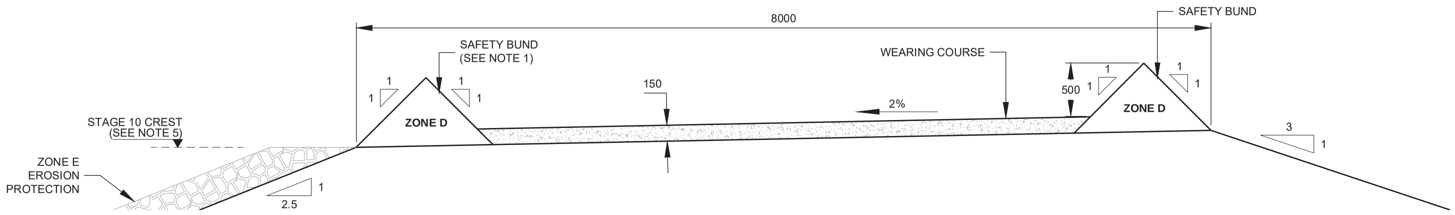
THIRD ANGLE PROJECTION

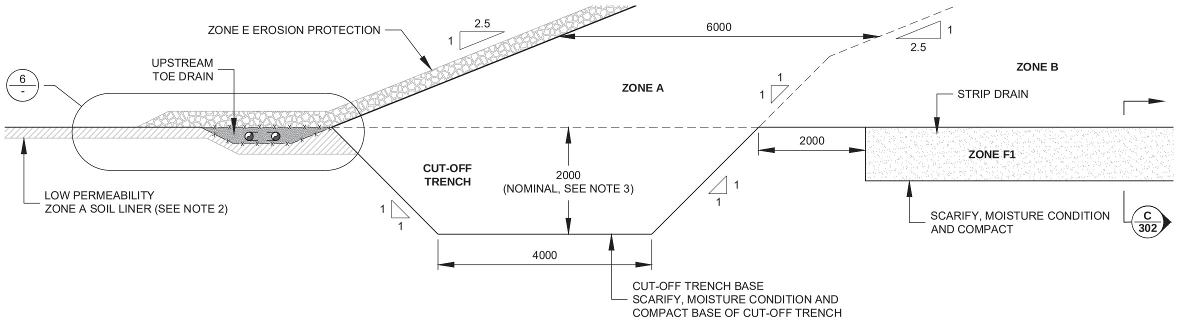
KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
EMBANKMENT SECTIONS AND DETAILS - SHEET 3

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-303
REV A

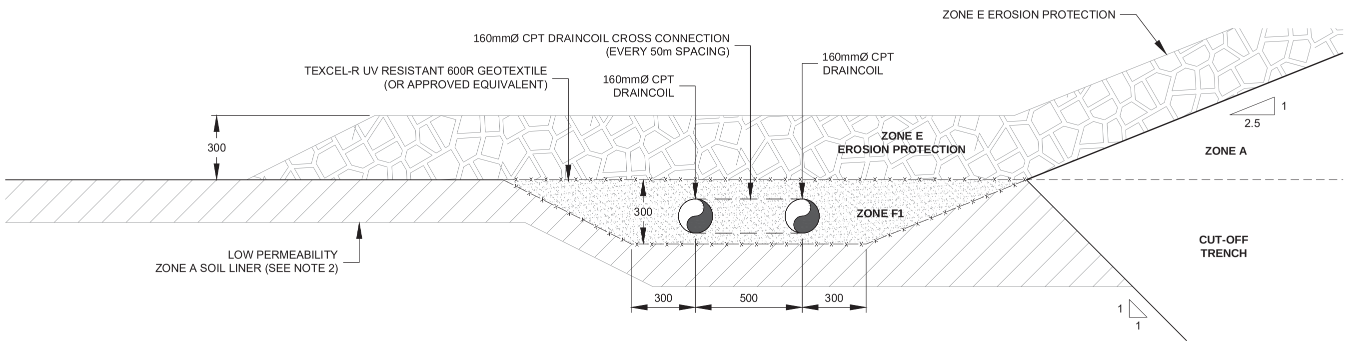
SHEET SIZE A3



4 / 303 **TYPICAL STAGE 10 EMBANKMENT CREST DETAIL**
1:50



5 / 303 **TYPICAL STAGE 10 CUT-OFF TRENCH DETAIL**
1:100



6 / - **TYPICAL STAGE 9/10 UPSTREAM TOE DRAIN DETAIL**
1:25

NOTES:

1. BREAKS IN SAFETY BUND AT 50m CENTRES (TO ALLOW DRAINAGE OF RAINFALL RUNOFF).
2. LOW PERMEABILITY SOIL LINER (ZONE A) IN TSF BASIN AREA AS FOLLOWS:
   - WHERE IN-SITU MATERIAL IS SUITABLE AS SOIL LINER: - RE-WORK TO COMPACT TO 200mm DEPTH.
   - WHERE IN-SITU MATERIAL IS UNSUITABLE AS SOIL LINER: - 300mm IMPORTED LOW PERMEABILITY SOIL.
3. CUT-OFF TRENCH TO BE EXCAVATED 1m (MIN.) INTO SUITABLE COMPETENT MATERIAL AS DETERMINED BY THE ENGINEER.
4. FOR ZONE SPECIFICATION DETAILS REFER TABLE 1 ON DRAWING 402-012-B201-301.
5. FOR EMBANKMENT CREST LEVELS REFER TABLE 2 ON DRAWING 402-012-B201-301.

NOT FOR CONSTRUCTION

REFERENCES

DRAWING No.	DRAWING TITLE
402-012-B201-301	EMBANKMENT SECTIONS AND DETAILS - SHEET 1
402-012-B201-303	EMBANKMENT SECTIONS AND DETAILS - SHEET 3

REVISIONS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

SHEET SIZE A3

DRAFT
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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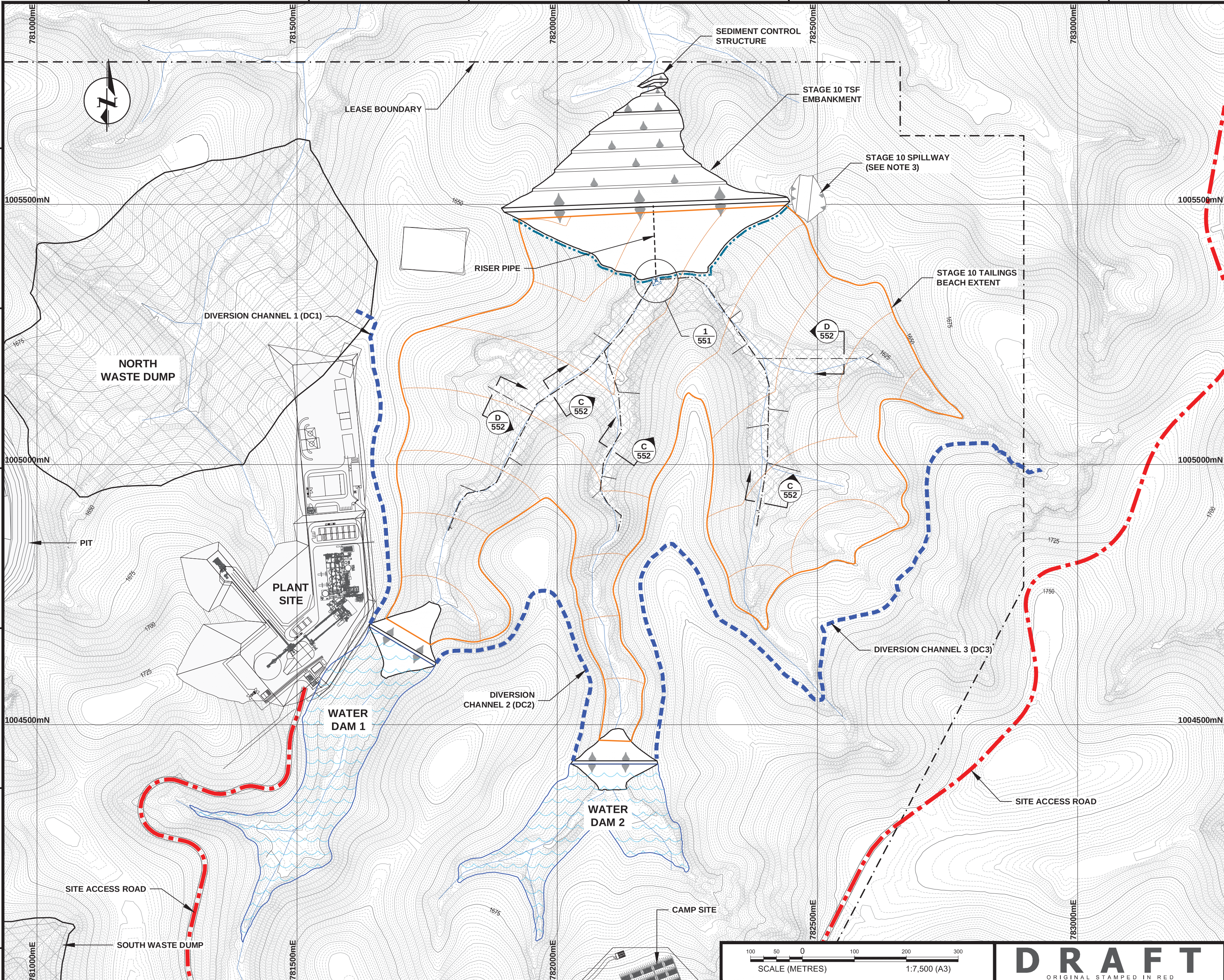
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
EMBANKMENT SECTIONS AND DETAILS - SHEET 4

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-304
REV A

287
410



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD
- EMBANKMENT TOE DRAIN
- MAIN COLLECTOR DRAIN
- BRANCH COLLECTOR DRAIN
- UNDERDRAINAGE WITH FINGER DRAINS AT 50m SPACINGS

NOTES:

1. 1m CONTOUR INTERVALS SHOWN.
2. FINAL TAILINGS STORAGE FACILITY LAYOUT SHOWN.
3. FINGER DRAINS ARE TO BE PLACED AT MAXIMUM 50m SPACINGS THROUGHOUT UNDERDRAINAGE BASIN.

NOT FOR CONSTRUCTION

SCALE (METRES) 100 50 0 100 200 300 1:7,500 (A3)

DRAFT
ORIGINAL STAMPED IN RED

REFERENCES

DRAWING No.	DRAWING TITLE
402-012-B201-551	UNDERDRAINAGE SECTIONS & DETAILS-SHEET 1
402-012-B201-552	UNDERDRAINAGE SECTIONS & DETAILS-SHEET 2

REVISIONS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
STAGE 10 UNDERDRAINAGE LAYOUT

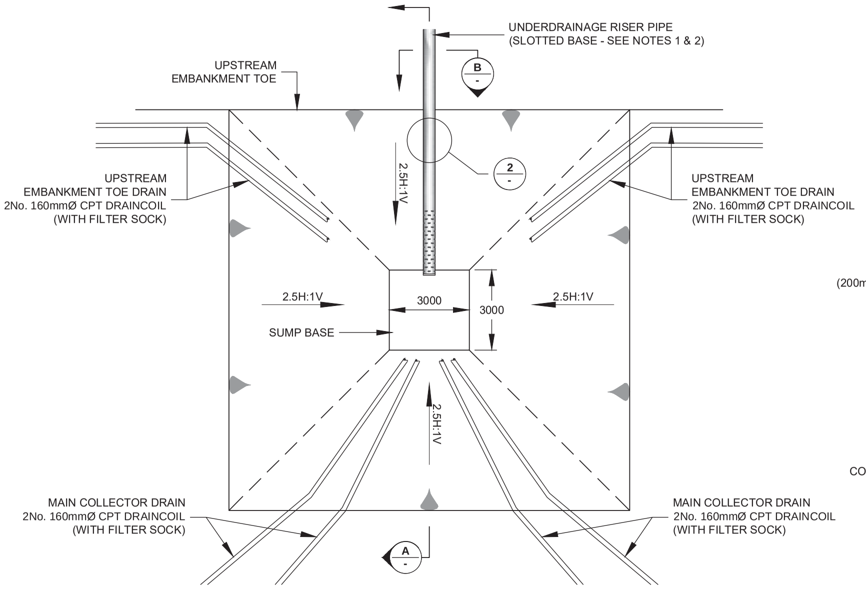
SCALE 1:7,500
STATUS FS
DRAWING NUMBER 402-012-B201-510
REV A

SHEET SIZE A3

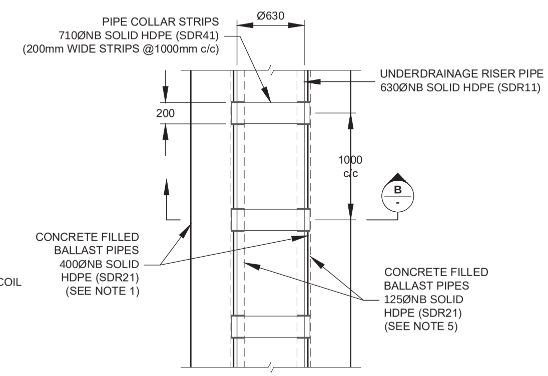
NOTES:

1. UNDERDRAINAGE RISER PIPE IS A 630ØNB SOLID HDPE (SDR11). ROWS OF THREE SLOTS SHALL BE EQUALLY SPACED AROUND THE BOTTOM OF THE PIPE. SLOTS TO BE 75mm x 6mm ON 150mm CENTRES.
2. UNDERDRAINAGE PUMPS AND ACCESSORIES DESIGNED AND SPECIFIED BY OTHERS.
3. BASIN LINER IN TSF AS FOLLOWS:
   *WHERE IN-SITU MATERIAL UNSUITABLE AS BASIN LINER
   - 200mm IMPORTED ZONE A MATERIAL

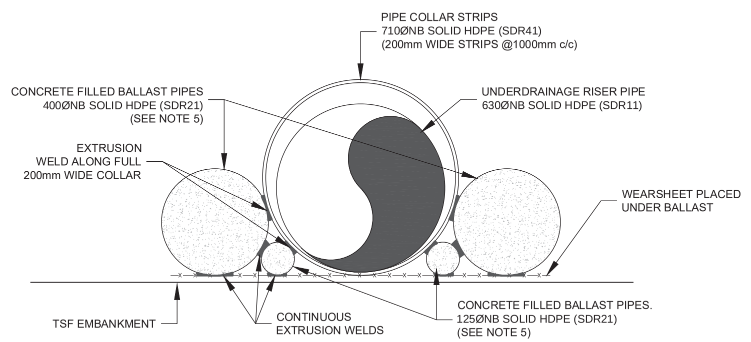
   *WHERE IN-SITU MATERIAL SUITABLE AS BASIN LINER
   - SCARIFY, MOISTURE CONDITION AND COMPACT IN-SITU MATERIAL 300mm
4. FOR ZONE SPECIFICATIONS REFER TABLE 2 ON DRAWING 301-686-C201-301.
5. BALLAST PIPES TO BE FILLED ON SITE AFTER INSTALLATION WITH CONCRETE OF DENSITY 2.3t/m^3 OR GREATER.



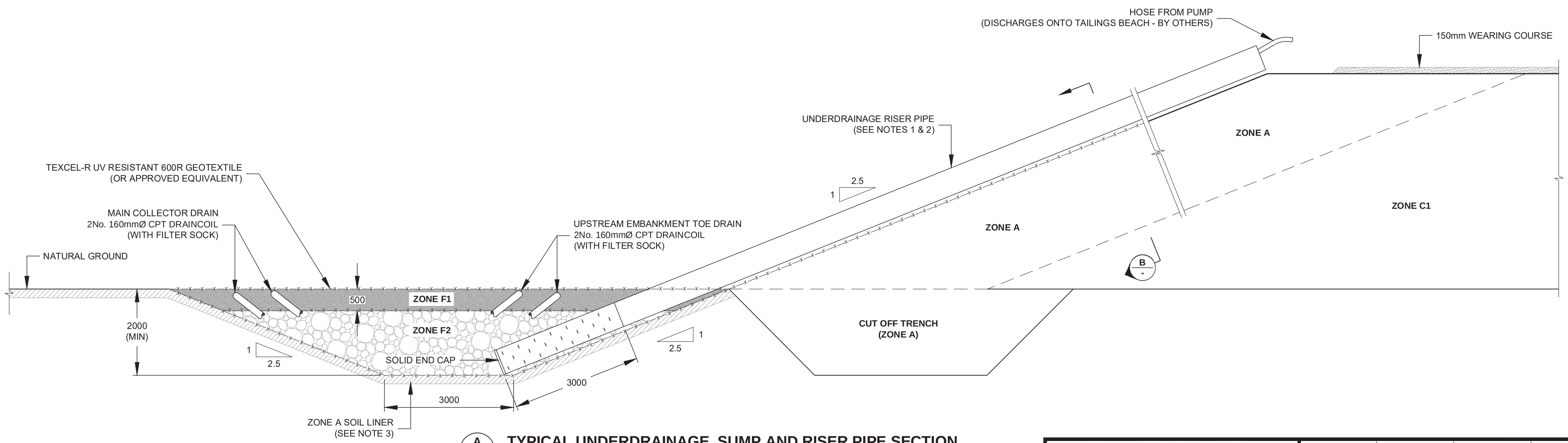
1 / 510 TYPICAL UNDERDRAINAGE SUMP
1:200



2 / - UNDERDRAINAGE RISER PIPE BALLAST SYSTEM PLAN VIEW
1:50



B / - UNDERDRAINAGE RISER PIPE BALLAST SYSTEM CROSS SECTION
1:20



A / - TYPICAL UNDERDRAINAGE SUMP AND RISER PIPE SECTION
1:100

NOT FOR CONSTRUCTION

REFERENCES	
DRAWING No.	DRAWING TITLE
402-012-B201-510	STAGE 10 UNDERDRAINAGE LAYOUT

SHEET SIZE A3

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

DRAFT
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

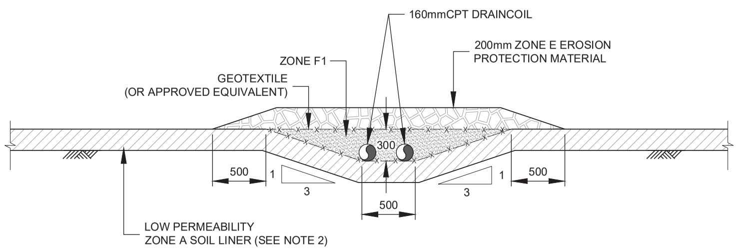
CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

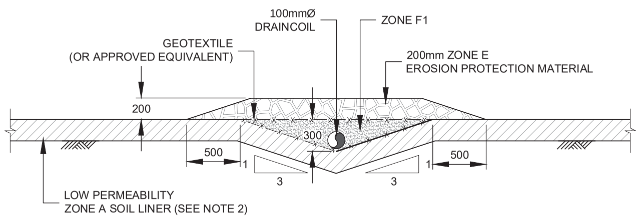
KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
UNDERDRAINAGE SECTIONS AND DETAILS - SHEET 1

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-551
REV A

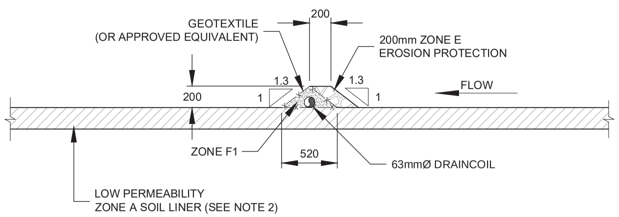
287 410



C 510 **MAIN COLLECTOR DRAIN SECTION** 1:50



D 510 **BRANCH DRAIN SECTION** 1:50



E - **FINGER DRAIN SECTION** 1:50

NOTES:

1. DRAINCOIL TO MEET REQUIREMENTS AS STATED IN AS2439 1-1981.
2. LOW PERMEABILITY SOIL LINER (ZONE A) IN TSF BASIN AREA AS FOLLOWS:
   - WHERE IN-SITU MATERIAL IS SUITABLE AS SOIL LINER:
     - RE-WORK TO COMPACT TO 200mm DEPTH.
   - WHERE IN-SITU MATERIAL IS UNSUITABLE AS SOIL LINER:
     - 300mm IMPORTED LOW PERMEABILITY SOIL.

UNDERDRAINAGE CONSTRUCTION SEQUENCE:

THE FOLLOWING GENERAL CONSTRUCTION SEQUENCE IS PROVIDED AS A GUIDE ONLY. CONTRACTOR TO ENSURE INSTALLATION METHOD ADOPTED ACHIEVES DESIGN INTENT.

1. EXCAVATE AND SHAPE MAIN COLLECTOR AND BRANCH DRAIN CHANNELS, LOAD AND HAUL MATERIAL TO EMBANKMENT.
2. PLACE, SPREAD, SCARIFY, CONDITION AND COMPACT LOW PERMEABILITY SOIL LINER ON THE ENTIRE BASIN AREA.
3. PLACE GEOTEXTILE OVER MAIN COLLECTOR AND BRANCH DRAIN CHANNELS AND FINGER DRAIN TRENCH (INCLUDING THE OVERLAP BETWEEN ROLLS).
4. PLACE AND SPREAD DRAINCOIL PIPE BEDDING (ZONE F 50mm MINIMUM).
5. PLACE, INSTALL AND CONNECT DRAINCOIL PIPES.
6. PLACE AND SPREAD ZONE F1 TO COVER DRAINCOIL PIPES (250mm ON TOP OF STEP 5).
7. PLACE AND SPREAD ZONE E OVER ZONE F1 (200mm THICK).
8. PLACE AND SPREAD ZONE E ON SIDE OF FINGER DRAINS, UPSTREAM OF FLOW (200mm THICK).

N O T   F O R   C O N S T R U C T I O N

REFERENCES

DRAWING No.	DRAWING TITLE
402-012-B201-510	STAGE 10 UNDERDRAINAGE LAYOUT

REVISIONS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

SHEET SIZE A3

D R A F T
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

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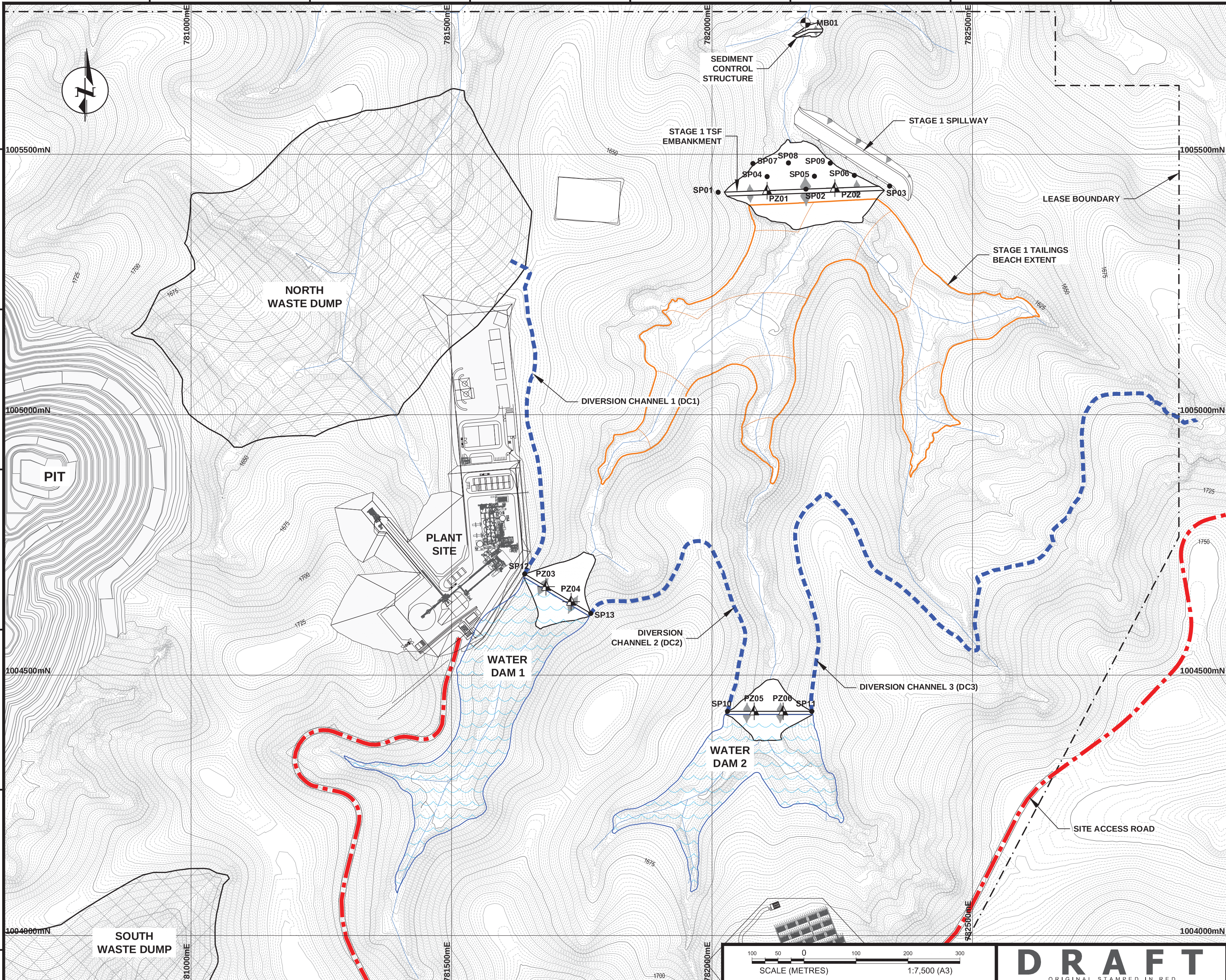
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
UNDERDRAINAGE SECTIONS AND DETAILS - SHEET 2

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-552
REV A



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD
- MONITORING BOREHOLE LOCATIONS
- PIEZOMETER LOCATIONS
- SETTLEMENT PIN LOCATIONS

NOTES:

1. 1m CONTOUR INTERVALS SHOWN.
2. STAGE 1 TAILINGS STORAGE FACILITY LAYOUT SHOWN.
3. FOR MONITORING INSTRUMENTATION DETAILS REFER DRAWING 402-012-B201-905.

NOT FOR CONSTRUCTION

SCALE (METRES) 100 50 0 100 200 300 1:7,500 (A3)

DRAFT
ORIGINAL STAMPED IN RED

REFERENCES	
DRAWING No.	DRAWING TITLE
402-012-B201-905	MONITORING INSTRUMENTATION DETAILS

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

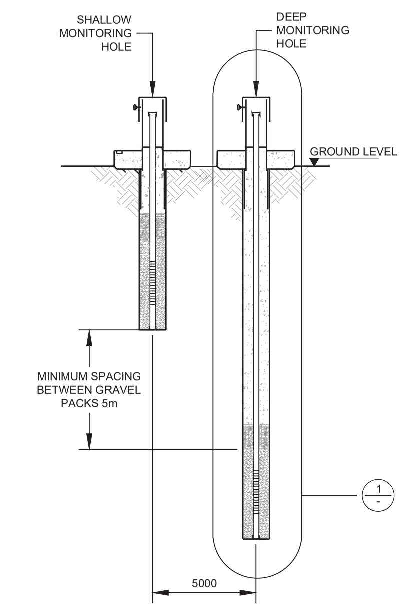
CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

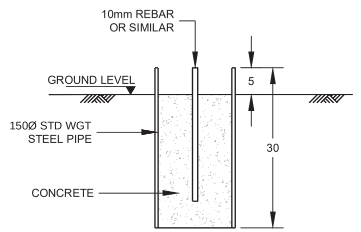
KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
MONITORING INSTRUMENTATION LAYOUT

SCALE 1:7,500
STATUS FS
DRAWING NUMBER 402-012-B201-900
REV A

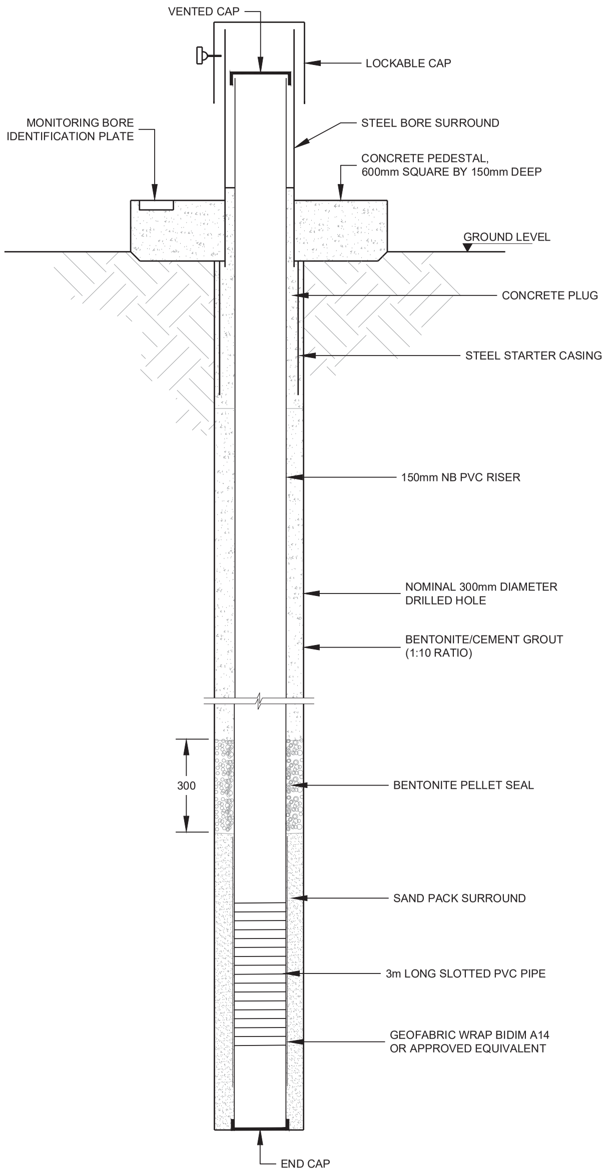
SHEET SIZE A3



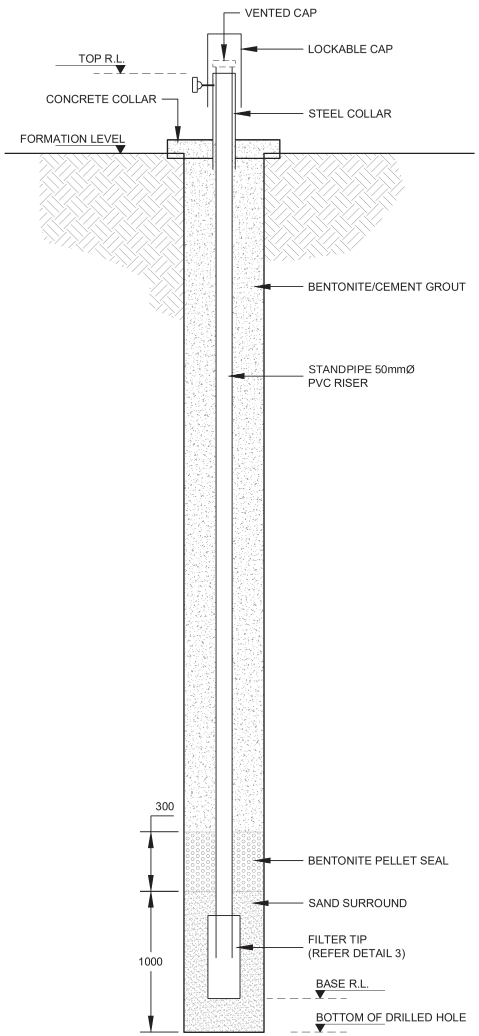
TYPICAL MONITORING BORE STATION ARRANGEMENT
N.T.S.



TYPICAL SURVEY STATION PIN SECTION
1:10



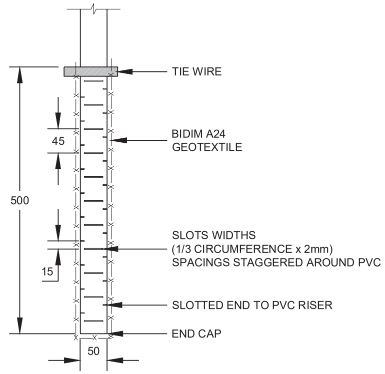
1 - TYPICAL MONITORING BORE INSTALLATION DETAIL
N.T.S.



TYPICAL STANDPIPE PIEZOMETER SECTION
N.T.S.

NOTES:

1. DEPTH OF MONITORING BORES TO BE DETERMINED ON SITE. (APPROXIMATELY 10m AND 30m)
2. BOREHOLE DRILLING TO BE SUPERVISED BY ENGINEER FOR GEOLOGICAL LOGGING.
3. INSTRUMENTATION LOCATIONS SHOWN ON DRAWINGS 402-012-B201-900.



3 - TYPICAL FILTER TIP DETAIL
1:10

NOT FOR CONSTRUCTION

REFERENCES	
DRAWING No.	DRAWING TITLE
401-012-A201-900	MONITORING INSTRUMENTATION LAYOUT

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

SHEET SIZE A3

DRAFT
ORIGINAL STAMPED IN RED

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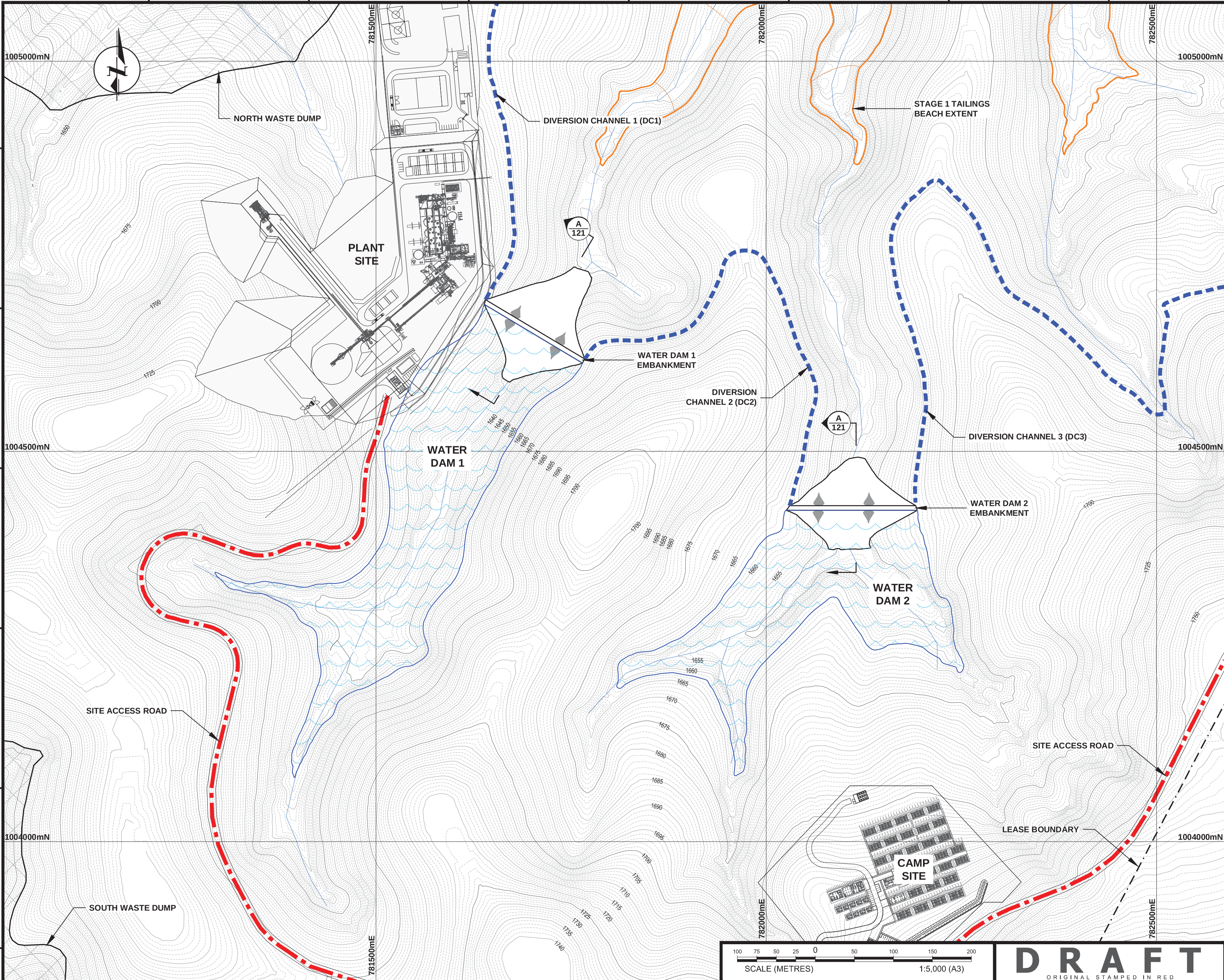
DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
TAILINGS STORAGE FACILITY
MONITORING INSTRUMENTATION DETAILS

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B201-905
REV A



LEGEND:

- LEASE BOUNDARY
- SITE ACCESS ROAD

NOTES:

1. 1m CONTOUR INTERVALS SHOWN.
2. STAGE 1 TAILINGS STORAGE FACILITY LAYOUT SHOWN.

NOT FOR CONSTRUCTION

SCALE (METRES) 100 75 50 25 0 50 100 150 200 — 1:5,000 (A3)

DRAFT
ORIGINAL STAMPED IN RED

DRAWING No.	DRAWING TITLE
402-012-B401-121	TYPICAL SECTIONS & DETAILS

REFERENCES

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

REVISIONS

Knight Piésold CONSULTING

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

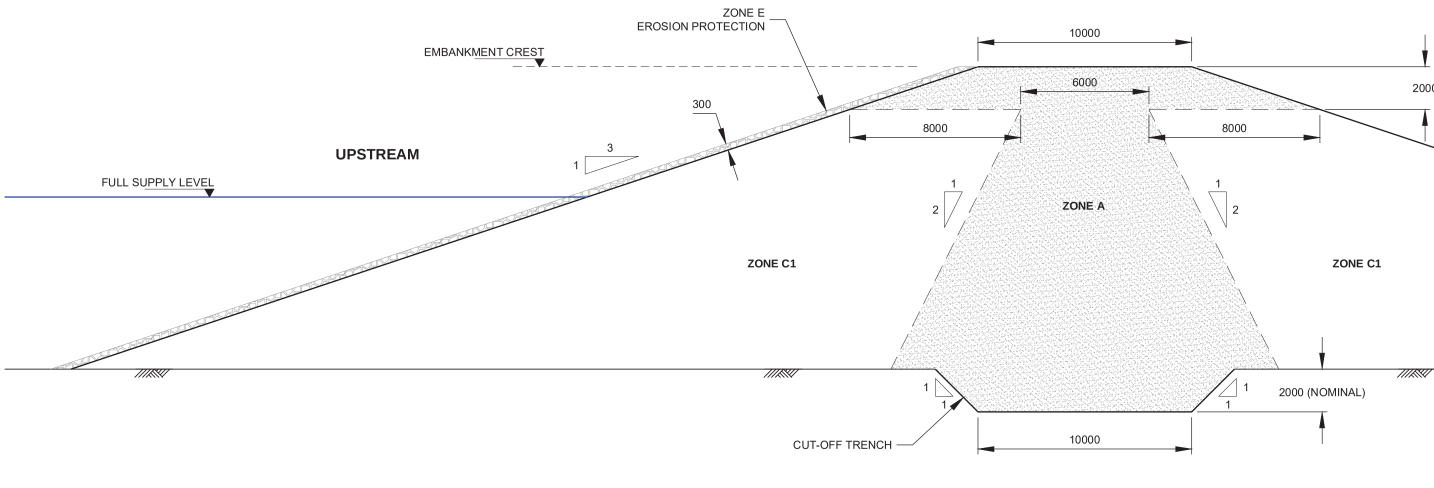
KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
WATER STORAGE DAM
GENERAL ARRANGEMENT

SCALE 1:5,000
STATUS FS
DRAWING NUMBER 402-012-B401-101
REV A

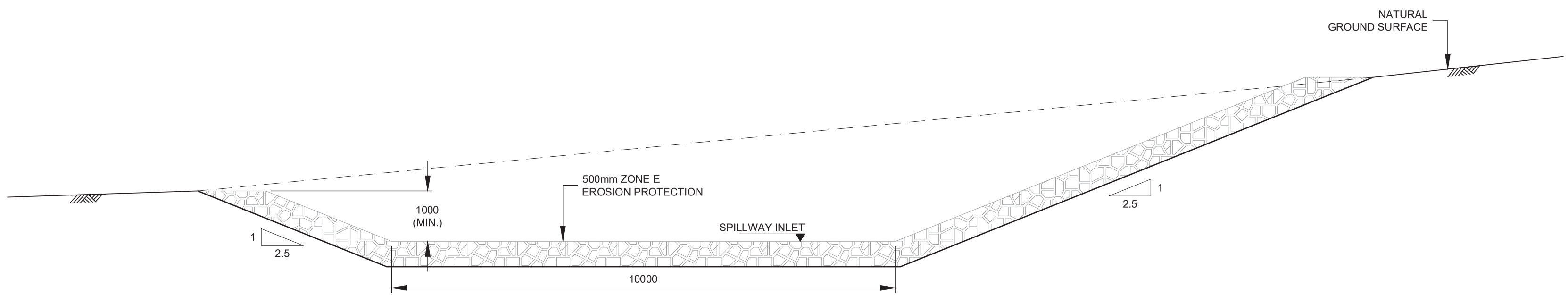
SHEET SIZE A3

NOTES:

1. SAFETY BUND TO BE CONSTRUCTED OF GENERAL FILL MATERIAL. BREAKS IN SAFETY BUND AT 50m CENTRES (TO ALLOW DRAINAGE OF RAINFALL RUNOFF).
2. CUT-OFF TRENCH TO BE EXCAVATED 1m (MIN.) INTO SUITABLE COMPETENT MATERIAL. AS DETERMINED BY THE ON SITE ENGINEER.
3. FOR ZONE SPECIFICATION DETAILS REFER TABLE 1 ON DRAWING 402-012-B201-301.



A 101 **TYPICAL WATER STORAGE DAM SECTION**
1:250



B 101 **TYPICAL WATER STORAGE DAM SPILLWAY SECTION**
1:100

NOT FOR CONSTRUCTION

REFERENCES	
DRAWING No.	DRAWING TITLE
402-012-B401-101	WATER STORAGE DAM LAYOUT

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

SHEET SIZE A3

DRAFT
ORIGINAL STAMPED IN RED

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

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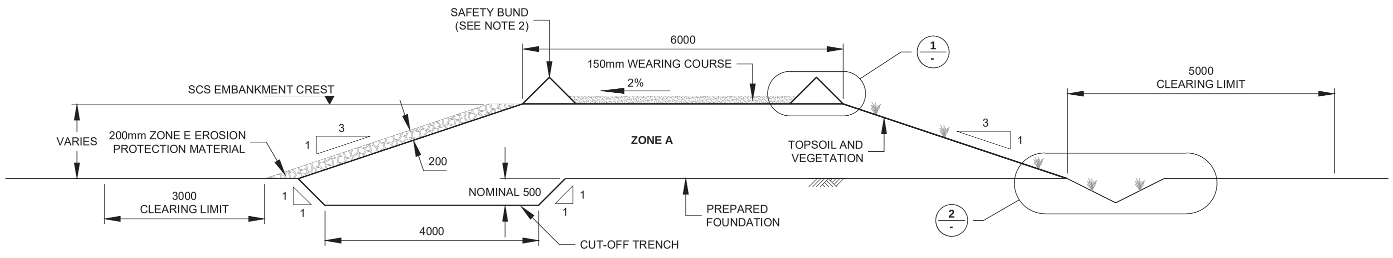
THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
WATER STORAGE DAM
TYPICAL SECTIONS AND DETAILS

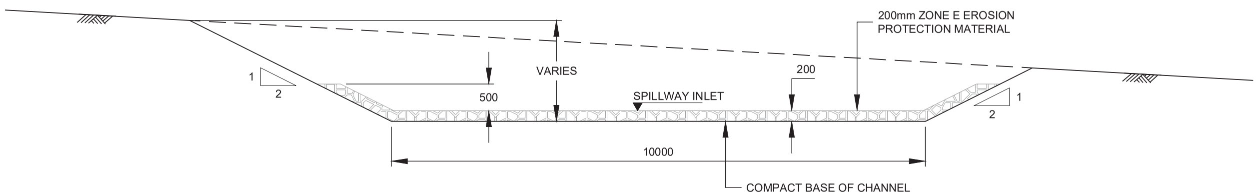
SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B401-121
REV A

NOTES:

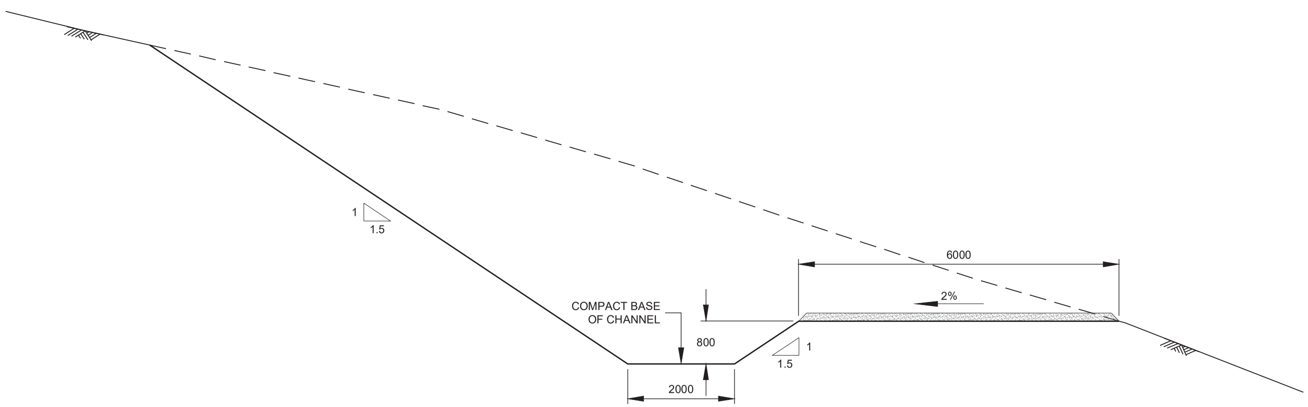
1. DOWNSTREAM TOE COLLECTION DITCH TO DISCHARGE INTO EXISTING WATER COURSE DOWNSTREAM OF EMBANKMENT.
2. SAFETY BUNDS TO HAVE BREAKS AT 20m CENTRES FOR SURFACE DRAINAGE.
3. FOR ZONE SPECIFICATION DETAILS REFER TABLE 1 ON DRAWING 402-012-B201-301.



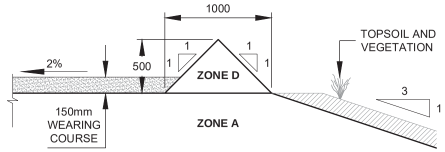
A - TYPICAL SEDIMENT CONTROL STRUCTURE EMBANKMENT SECTION 1:100



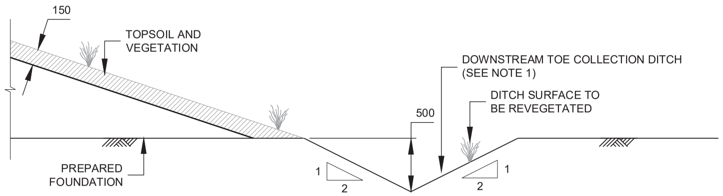
B - TYPICAL SPILLWAY CHANNEL SECTION 1:100



C - TYPICAL DIVERSION CHANNEL SECTION 1:100



1 - TYPICAL SAFETY BERM DETAIL 1:50



2 - TYPICAL DOWNSTREAM TOE DRAIN COLLECTION DITCH DETAIL 1:50

NOT FOR CONSTRUCTION

DRAFT
ORIGINAL STAMPED IN RED

REFERENCES	
DRAWING No.	DRAWING TITLE
402-012-B201-301	TSF-EMBANKMENT SECTIONS & DETAILS-SHEET 1

REV	DATE	DESCRIPTION	DRN	CKD	DESIGN	APP	CLIENT APP
A		ISSUED FOR FEASIBILITY STUDY	PRK				

DATE	CHECKED	DESIGNED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

THIRD ANGLE PROJECTION

KEFI MINERALS PLC
TULU KAPI GOLD PROJECT
SURFACE WATER MANAGEMENT
TYPICAL SECTIONS AND DETAILS

SCALE AS SHOWN
STATUS FS
DRAWING NUMBER 402-012-B501-301
REV A

SHEET SIZE A3

287

410

APPENDIX 12.1

PROCESSING OPERATING COST ESTIMATE DETAIL

First Fill and Opening Stock Estimate

Item		Cost (Total) US$/Unit	Unit	Annual Consumption* (units)	Delivery Size	First Fill		Opening Stocks			Total
						units	US$	units	No Days	US$	US$
Primary Jaw Crusher	Fixed Jaw	$24,504	set	8.8 set/yr	1 set(s)	Included	0	2 set(s)	83	49,008	49,008
	Moving Jaw	$24,504	set	5.9 set/yr	1 set(s)	Included	0	1 set(s)	62	24,504	24,504
Product Screen	Replacement Deck	$7,191	per screen	6.0 set/yr	1 set(s)	Included	0	1 set(s)	61	7,191	7,191
SAG Mill	Lifters/Liners	$720,030	set	1.7 set/yr	1 set(s)	Included	0	0.25 set(s)	55	180,007	180,007
SAG Mill	Grinding Media	$1,308	t	1,124 t/yr	20 t	141 t	184,327	139 t	45	181,208	365,535
Sodium Cyanide		$3,098	t	499 t/yr	20 t	8 t	24,784	62 t	45	190,565	215,349
Quicklime (90% CaO)		$608	t	408 t/yr	20 t	10 t	6,080	50 t	45	30,583	36,663
Carbon		$2,698	t	87 t/yr	20 t	84 t	226,632	11 t	45	28,941	255,573
Flocculant		$3,148	t	0 t/yr	1 t	0.1 t	315	0 t	45	0	315
Hydrochloric Acid		$828	t	261 t/yr	1 t	0.6 t	472	32 t	45	26,679	27,151
Sodium Hydroxide		$1,123	t	973 t/yr	1 t	3.0 t	3,369	120 t	45	134,672	138,041
Sodium Metabisulpite		$843	t	1,737 t/yr	1 t	8.0 t	6,744	214 t	45	180,571	187,315
Copper Sulphate		$2,383	t	364 t/yr	1 t	1.3 t	3,098	45 t	45	106,882	109,980
Stainless Steel Stocking		$399	kg	66 kg/yr	1 set(s)	44 kg	17,570	1 set(s)	365	17,570	35,140
Crucibles		$1,785	ea	9 /yr	1 each	2	3,570	3	122	5,355	8,925
Borax		$1,748	t	0.81 t/yr	1 t	0 kg	0	1,000 kg	452	1,748	1,748
Silica		$978	t	0.34 t/yr	1 t	0 kg	0	1,000 kg	1,067	978	978
Nitre		$1,048	t	0.11 t/yr	1 t	0 kg	0	1,000 kg	3,333	1,048	1,048
Soda Ash		$958	t	0.11 t/yr	1 t	0 kg	0	1,000 kg	3,333	958	958
Antiscalant – Decant Return		$2,248	t	5.50 t/yr	1 t	0 kg	0	1,000 kg	66	2,248	2,248
Antiscalant - Elution		$3,398	t	0.15 t/yr	1 t	0 kg	0	1,000 kg	2,380	3,398	3,398
Sulphamic Acid		$1,948	t	1.04 t/yr	1 t	20 kg	39	980 kg	344	1,909	1,948
Diesel		$620	kL	0.27 kL/t	Consignment						
Lubricants		$40,000	lot			1	40,000				40,000
Plant Operating Tools & Equipment		$10,000	lot			1	10,000				10,000
Gold Room Tools & Equipment		$10,000	lot			1	10,000				10,000
Laboratory Reagents		$0	lot			1	0				0
TOTAL CONSUMABLE COST							**536,999**			**1,176,024**	**1,713,023**
*** Based on Felsic ore**											

APPENDIX 13.1

PRELIMINARY BASELINE SCHEDULE – CRITICAL PATH

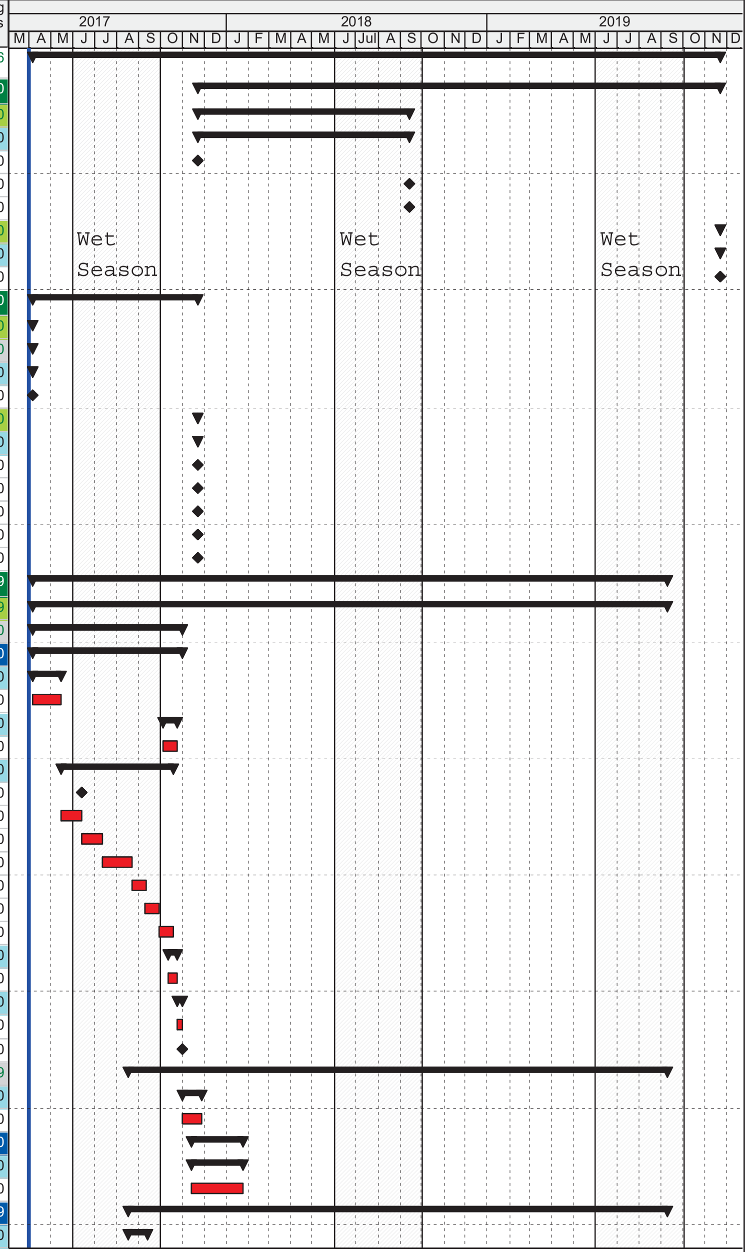
30-Mar-17 11:12

PROJECT: **Tulu Kapi Gold Project** - Kefi Minerals

Proposal: **KEFI P3540_D1**

DRAFT

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
Tulu Kapi Gold Project - Preliminary PEP_Water Infarstructure Development		661	06-Apr-17	21-Nov-19	0	274129.6
PROJECT MILESTONES		501	23-Nov-17	21-Nov-19	0	0.0
CLIENT INTERFACES		202	23-Nov-17	13-Sep-18	1	0.0
Owners		202	23-Nov-17	13-Sep-18	1	0.0
KGP-IN-1000	EPC Contract Award	0	23-Nov-17*		0	0.0
KGP-IN-1030	Plant Earthworks Complete *Full & Unimpeded Access to CIL & Milling Area's Req'd	0	13-Sep-18		3	0.0
KGP-IN-1600	Site Security Services & Fencing in Place	0	13-Sep-18		3	0.0
EPC		0	21-Nov-19	21-Nov-19	0	0.0
All Disciplines		0	21-Nov-19	21-Nov-19	0	0.0
KGP-IN-1210	Commissioning/Performance Testing Complete	0		21-Nov-19	0	0.0
OWNERS		160	06-Apr-17	23-Nov-17	0	0.0
APPROVALS		0	06-Apr-17	06-Apr-17	0	0.0
Internal		0	06-Apr-17	06-Apr-17	0	0.0
Owners		0	06-Apr-17	06-Apr-17	0	0.0
KGP-IN-2640	Approval to proceed with Early Works Design, Procurement and Infrastructure Development	0	06-Apr-17*		0	0.0
EPC DESIGN INPUTS		0	22-Nov-17	23-Nov-17	0	0.0
Owners		0	22-Nov-17	23-Nov-17	0	0.0
KGP-IN-2120	Site Geotechnical Data	0		22-Nov-17	0	0.0
KGP-IN-2130	Topographical Survey	0		22-Nov-17	0	0.0
KGP-IN-2140	Hydrological Study	0		22-Nov-17	0	0.0
KGP-IN-2160	Environmental Study	0		22-Nov-17	0	0.0
KGP-IN-2150	MET Testwork	0		23-Nov-17	0	0.0
PHASE 1 - EARLY WORKS - PROJECT DEVELOPMENT		608	06-Apr-17	09-Sep-19	0	65619.9
EPCM Project Development		608	06-Apr-17	09-Sep-19	0	65619.9
000 - Site Establish		143	06-Apr-17	31-Oct-17	0	4890.0
060 - Construction Accomodation (Exploration Camp Upgrade)		143	06-Apr-17	31-Oct-17	0	4890.0
All Disciplines		25	06-Apr-17	15-May-17	0	70.0
KGP-IN-1500	Construction/Exploration Camp Upgrade General Arrangement	25	06-Apr-17	15-May-17*	0	70.0
Electrical & Instrumentation		14	04-Oct-17	24-Oct-17	0	300.0
KGP-IN-1720	Install Village Electrical Reticulation	21	04-Oct-17	24-Oct-17	0	300.0
Buildings & Architectural		111	16-May-17	19-Oct-17	0	3620.0
KGP-IN-1520	Construction Camp Upgrade - Supply & Install Contact	0		13-Jun-17	0	0.0
KGP-IN-3210	Tender & Award Exploration Camp Upgrade- Accom Units, Mess Ablutions & Tents Package	20	16-May-17	13-Jun-17	0	368.0
KGP-IN-1550	Design Construction Camp Accommodation Units & Buildings	20	14-Jun-17	11-Jul-17	0	160.0
KGP-IN-3220	Manufacture Additional Accom Buildings - (Units, Additional Mess Floors, Ablutions & Tents)	30	12-Jul-17	22-Aug-17	0	368.0
KGP-IN-3230	Transport Temporary Camp - Accom Units, Mess Ablutions & Tents	21	22-Aug-17	11-Sep-17	0	320.0
KGP-IN-1700	Install Laundry, Admin Office & Shop Buildings	21	09-Sep-17	29-Sep-17	0	1400.0
KGP-IN-1690	Install Dry / Wet Mess Buildings	21	29-Sep-17	19-Oct-17	0	1004.0
Infrastructure		9	11-Oct-17	24-Oct-17	0	100.0
KGP-IN-1710	Install Construction Camp Fencing & Flood Lighting	14	11-Oct-17	24-Oct-17	0	100.0
Commissioning		5	24-Oct-17	31-Oct-17	0	800.0
KGP-IN-1770	Construction/Exploration Camp Accomodation Commissioning	7	24-Oct-17	31-Oct-17	0	800.0
KGP-IN-1760	Construction/Exploration Camp Ready for EPC Occupation	0		31-Oct-17	0	0.0
300 - Infrastructure		517	17-Aug-17	09-Sep-19	0	50837.9
Earthworks		20	31-Oct-17	28-Nov-17	0	0.0
KGP-IN-13640	Mobilise Early Works Bulk EW Contractor	30	31-Oct-17	28-Nov-17	0	0.0
310 - Public Roads, Site Roads & Tracks		49	13-Nov-17	24-Jan-18	0	7170.0
Earthworks		49	13-Nov-17	24-Jan-18	0	7170.0
KGP-IN-11610	Access Road to TSF & Storage Dams	68	13-Nov-17	24-Jan-18	0	7170.0
330 - Water Supply (Water Storage Dams)		517	17-Aug-17	09-Sep-19	0	43667.9
Owners		20	17-Aug-17	13-Sep-17	3	368.0



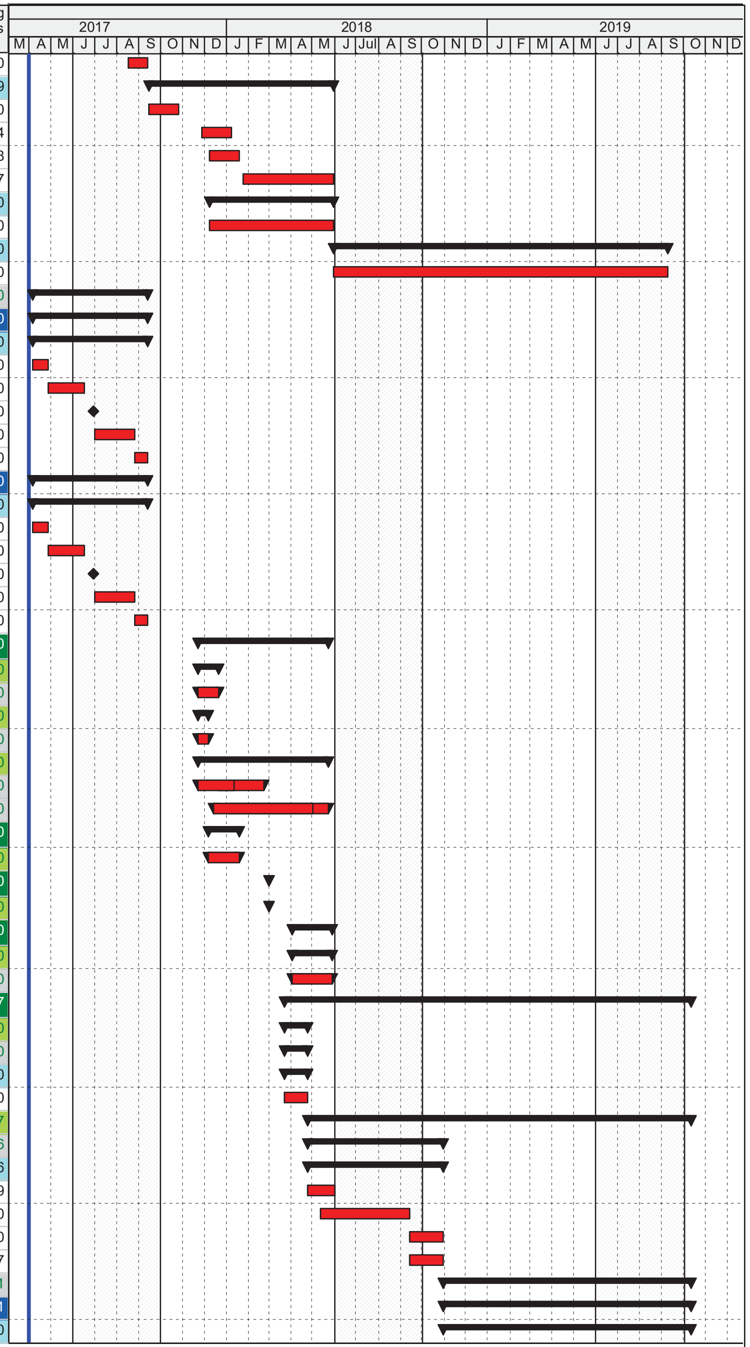
Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Preliminary Baseline Schedule Development - Critical Path

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
KGP-IN-8710	Tender & Award Water Storage Dams Design & Construction	20	17-Aug-17	13-Sep-17	2	368.0
Earthworks		176	14-Sep-17	30-May-18	0	39380.9
KGP-IN-3250	Water Balance Calculations & Storage Dams Design	30	14-Sep-17	26-Oct-17	2	0.0
KGP-IN-3290	Clear & Grub	34	28-Nov-17	08-Jan-18	5	6866.4
KGP-IN-3270	Cut to Fill & Foundation Prep on Storage Dams	34	09-Dec-17	19-Jan-18	5	5250.8
KGP-IN-11250	Raw Water Storage Dams Site Preparation, Embankment Construction & Liner Installation	135	24-Jan-18*	30-May-18*	0	27263.7
Piping		115	08-Dec-17	30-May-18	0	3919.0
KGP-IN-13620	Construction Water Supply Piping Installation	175	08-Dec-17	30-May-18*	0	3919.0
Infrastructure		322	30-May-18	09-Sep-19	0	0.0
KGP-IN-13630	Water Storage Dams Ready For Use (Commissioned & Commence Water Storage)	525	30-May-18*	09-Sep-19	0	0.0
530 - Specialist Consultants		111	06-Apr-17	13-Sep-17	3	9892.0
533 - Geotechnical		111	06-Apr-17	13-Sep-17	3	4946.0
All Disciplines		111	06-Apr-17	13-Sep-17	3	4946.0
KGP-IN-9380	Prepare Geotechnical Investigation Agreement & Scope	13	06-Apr-17	27-Apr-17	2	0.0
KGP-IN-9970	Tender Geotechnical Testwork	35	28-Apr-17	16-Jun-17	2	0.0
KGP-IN-10320	Award Geotechnical Study Contract	0	29-Jun-17		2	0.0
KGP-IN-9910	Carry Out Geotechnical Testwork & Submit Report RevA	60	30-Jun-17	25-Aug-17	4	4946.0
KGP-IN-9950	Submit Geotechnical Report Rev0	20	25-Aug-17	13-Sep-17	4	0.0
534 - Hydrology		111	06-Apr-17	13-Sep-17	3	4946.0
All Disciplines		111	06-Apr-17	13-Sep-17	3	4946.0
KGP-IN-9050	Prepare Hydrology Investigation Agreement & Scope	13	06-Apr-17	27-Apr-17	2	0.0
KGP-IN-9060	Tender Hydrology Testwork	35	28-Apr-17	16-Jun-17	2	0.0
KGP-IN-9070	Award Hydrology Study Contract	0	29-Jun-17		2	0.0
KGP-IN-9080	Carry Out Hydrology Testwork & Submit Report RevA	60	30-Jun-17	25-Aug-17	4	4946.0
KGP-IN-9120	Submit Hydrology Report Rev0	20	25-Aug-17	13-Sep-17	4	0.0
ENGINEERING, SPECIFICATIONS & DRAFTING		122	23-Nov-17	23-May-18	5	3769.0
Engineering Deliverables		20	23-Nov-17	20-Dec-17	0	576.0
Process		20	23-Nov-17	20-Dec-17	0	576.0
Engineering Datasheets/ Specifications		10	23-Nov-17	06-Dec-17	5	128.0
F - Mechanical		10	23-Nov-17	06-Dec-17	5	128.0
Drafting		122	23-Nov-17	23-May-18	5	3065.0
110 - Treatment plant General		62	23-Nov-17	22-Feb-18	0	530.0
130 - Milling		107	14-Dec-17	23-May-18	5	2535.0
PROCUREMENT		28	07-Dec-17	19-Jan-18	14	0.0
Long lead Items		28	07-Dec-17	19-Jan-18	14	0.0
VENDOR DATA		0	01-Mar-18	01-Mar-18	5	0.0
Long Lead		0	01-Mar-18	01-Mar-18	5	0.0
MANUFACTURE & FABRICATION		39	03-Apr-18	29-May-18	4	240.0
Standard		39	03-Apr-18	29-May-18	4	240.0
C - Concrete		39	03-Apr-18	29-May-18	4	240.0
CONSTRUCTION		390	23-Mar-18	12-Oct-19	0	203820.7
000 - Site Wide		20	23-Mar-18	24-Apr-18	0	0.0
Mobilisation		20	23-Mar-18	24-Apr-18	0	0.0
Earthworks		20	23-Mar-18	24-Apr-18	0	0.0
KGP-IN-12850	Mobilise Plantsite Bulk EW Contractor	30	23-Mar-18	24-Apr-18	0	0.0
100 - PROCESS PLANT		370	24-Apr-18	12-Oct-19	0	196174.7
110 - Treatment plant General		133	24-Apr-18	31-Oct-18	0	30922.6
Earthworks		133	24-Apr-18	31-Oct-18	0	30922.6
KGP-IN-8610	Plant Site Clear & Grub	45	24-Apr-18*	01-Jun-18	0	1275.9
KGP-IN-8680	Bulk Site Earthworks	143	13-May-18	13-Sep-18	0	21118.0
KGP-IN-8730	In-plant Roads	56	13-Sep-18	31-Oct-18	0	2425.0
KGP-IN-8700	Site Drainage & Culverts	56	13-Sep-18	31-Oct-18	0	6103.7
120 - Feed Preparation		237	31-Oct-18	12-Oct-19	0	80857.1
121 - Primary Crushing		237	31-Oct-18	12-Oct-19	0	80857.1
Earthworks		237	31-Oct-18	12-Oct-19	0	7961.0



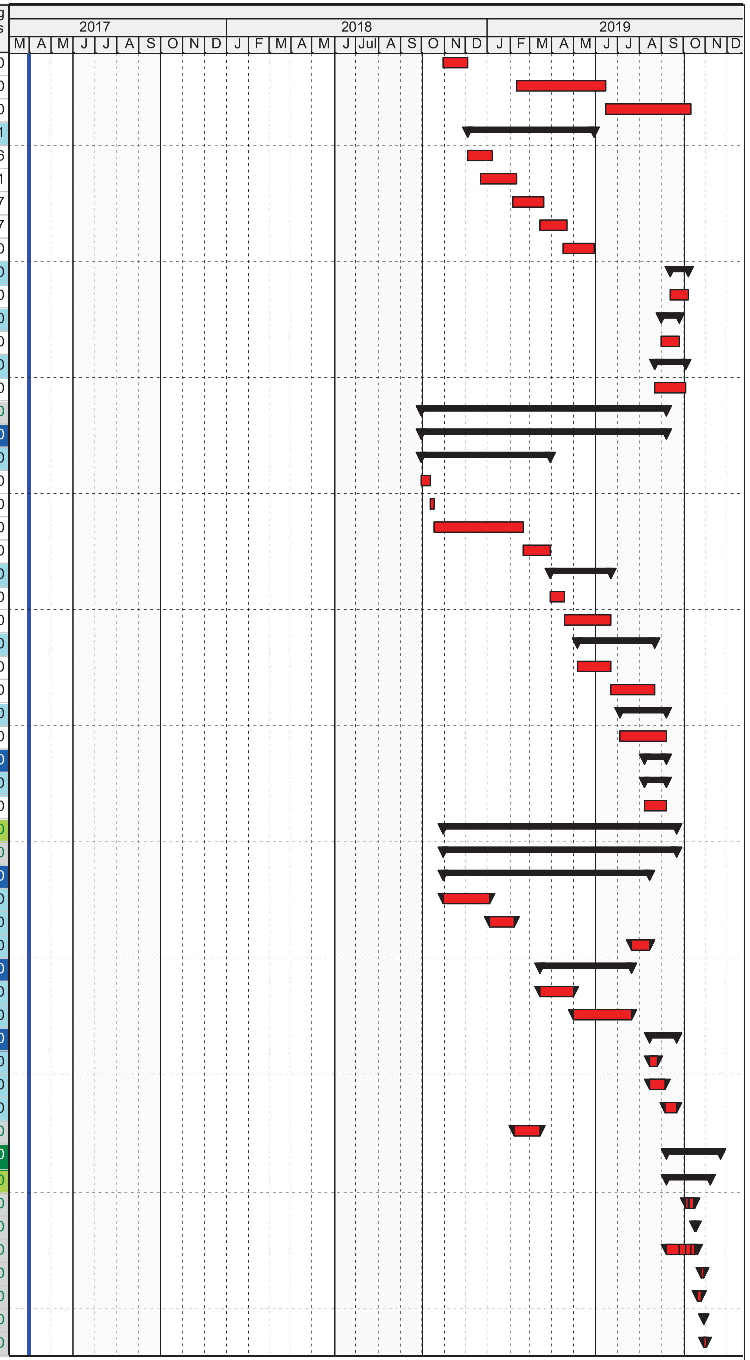
Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Preliminary Baseline Schedule Development - Critical Path

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
KGP-IN-8970	Crushing & Stockpiling Facility Detailed Earthworks	39	31-Oct-18*	04-Dec-18	0	1161.0
KGP-IN-8800	Crushing Chamber & Walls Backfill (Est)	143	10-Feb-19	14-Jun-19	0	6400.0
KGP-IN-8870	ROM Pad - Client	140	14-Jun-19	12-Oct-19	0	400.0
Civils		118	04-Dec-18	29-May-19	2	62332.1
KGP-IN-8740	Raft Concrete	25	04-Dec-18	07-Jan-19	0	8605.6
KGP-IN-8750	First Lift & Suspended Slab	44	21-Dec-18	10-Feb-19	0	12081.1
KGP-IN-8760	Second Lift & Suspended Slab	50	05-Feb-19	20-Mar-19	5	14521.7
KGP-IN-8770	Third Lift & Suspended Slab	44	14-Mar-19	21-Apr-19	5	12254.7
KGP-IN-8780	Fourth Lift & Suspended Slab	50	16-Apr-19	29-May-19	5	14869.0
Platework		16	12-Sep-19	07-Oct-19	0	5521.0
KGP-IN-8860	Install Rom Bin	29	12-Sep-19	07-Oct-19	0	5521.0
Piping		19	30-Aug-19	26-Sep-19	0	1134.0
KGP-IN-8850	Primary Crushing Area Piping Installation	31	30-Aug-19	26-Sep-19	0	1134.0
Electrical & Instrumentation		31	22-Aug-19	05-Oct-19	0	3909.0
KGP-IN-8840	Crushing Area Electrical Installation	51	22-Aug-19	05-Oct-19	0	3909.0
130 - Milling		236	30-Sep-18	08-Sep-19	1	84395.0
132 - Grinding		236	30-Sep-18	08-Sep-19	1	83932.0
Civils		124	30-Sep-18	28-Mar-19	1	63019.0
KGP-IN-9530	Excavation	15	30-Sep-18	13-Oct-18	3	485.0
KGP-IN-9540	Blinding	6	13-Oct-18	18-Oct-18	3	1150.0
KGP-IN-9550	Concrete Base & Structure	126	18-Oct-18	19-Feb-19	3	48755.0
KGP-IN-9570	Mechanical Plinths & Apron Slabs	44	19-Feb-19	28-Mar-19	3	12629.0
Structural Steel		57	28-Mar-19	22-Jun-19	2	6941.0
KGP-IN-9390	Grinding Area Mill Access Steel	22	28-Mar-19	17-Apr-19	3	1234.0
KGP-IN-13450	Mill Building Structural Steel	78	17-Apr-19	22-Jun-19	3	5707.0
Mechanical		77	06-May-19	22-Aug-19	1	7026.0
KGP-IN-9600	Set Up and Pre-Assmbley of Mill Components	55	06-May-19	22-Jun-19	3	3911.0
KGP-IN-9620	Install SAG Mill	70	22-Jun-19	22-Aug-19	3	3115.0
Electrical & Instrumentation		46	05-Jul-19	08-Sep-19	1	6946.0
KGP-IN-9520	Grinding Electrical Installation	75	05-Jul-19	08-Sep-19	3	6946.0
133 - Classification		23	07-Aug-19	08-Sep-19	1	463.0
Electrical & Instrumentation		23	07-Aug-19	08-Sep-19	1	463.0
KGP-IN-9470	Classification Area Electrical Installation	37	07-Aug-19	08-Sep-19	3	463.0
200 - REAGENTS & PLANT SERVICES		223	31-Oct-18	21-Sep-19	1	7646.0
220 - Water Services		223	31-Oct-18	21-Sep-19	1	6534.0
222 - Raw Water		197	31-Oct-18	15-Aug-19	1	2062.0
Earthworks		43	31-Oct-18	03-Jan-19	1	0.0
Civils		24	03-Jan-19	07-Feb-19	1	1798.0
Mechanical		19	20-Jul-19	15-Aug-19	1	264.0
223 - Process Water		87	15-Mar-19	20-Jul-19	2	3916.0
Civils		29	15-Mar-19	30-Apr-19	2	3351.0
Platework		57	30-Apr-19	20-Jul-19	2	565.0
225 - Gland Water		26	15-Aug-19	21-Sep-19	1	556.0
Mechanical		7	15-Aug-19	26-Aug-19	2	132.0
Piping		16	15-Aug-19	06-Sep-19	0	267.0
Electrical & Instrumentation		10	06-Sep-19	21-Sep-19	1	157.0
230 - Plant Services		25	07-Feb-19	15-Mar-19	1	1112.0
COMMISSIONING		53	08-Sep-19	21-Nov-19	0	680.0
100 - PROCESS PLANT		43	08-Sep-19	08-Nov-19	0	424.0
Primary Crushing		8	05-Oct-19	16-Oct-19	0	128.0
Surge Bin		2	16-Oct-19	19-Oct-19	0	24.0
Milling and Classification		29	08-Sep-19	21-Oct-19	0	112.0
Screening & Thickening		2	26-Oct-19	29-Oct-19	0	24.0
CIL		5	21-Oct-19	26-Oct-19	0	24.0
Desorption		1	29-Oct-19	30-Oct-19	0	40.0
Gold room		2	30-Oct-19	02-Nov-19	0	40.0



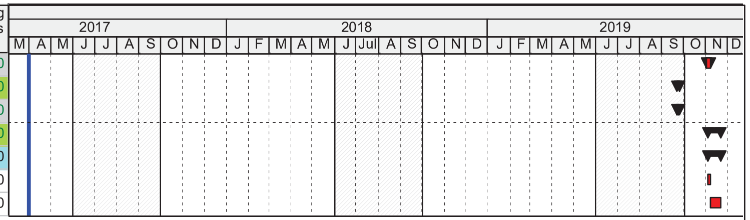
Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Preliminary Baseline Schedule Development - Critical Path

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
Carbon Regeneration		4	02-Nov-19	08-Nov-19	0	32.0
200 - REAGENTS & PLANT SERVICES		2	21-Sep-19	24-Sep-19	2	32.0
Gland Water		2	21-Sep-19	24-Sep-19	2	32.0
PROCESS COMMISSIONING		14	03-Nov-19	21-Nov-19	0	224.0
Process		14	03-Nov-19	21-Nov-19	0	224.0
KGP-IN-12830	Plant Process Commissioning	14	03-Nov-19	08-Nov-19	0	112.0
KGP-IN-12840	Performance Testing	40	08-Nov-19	21-Nov-19	0	112.0



Remaining Level of Effort
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Preliminary Baseline Schedule Development - Critical Path

P3540-000-SCH-001_B (Water Infrastructure Development)			
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30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

APPENDIX 13.2

PRELIMINARY BASELINE SCHEDULE

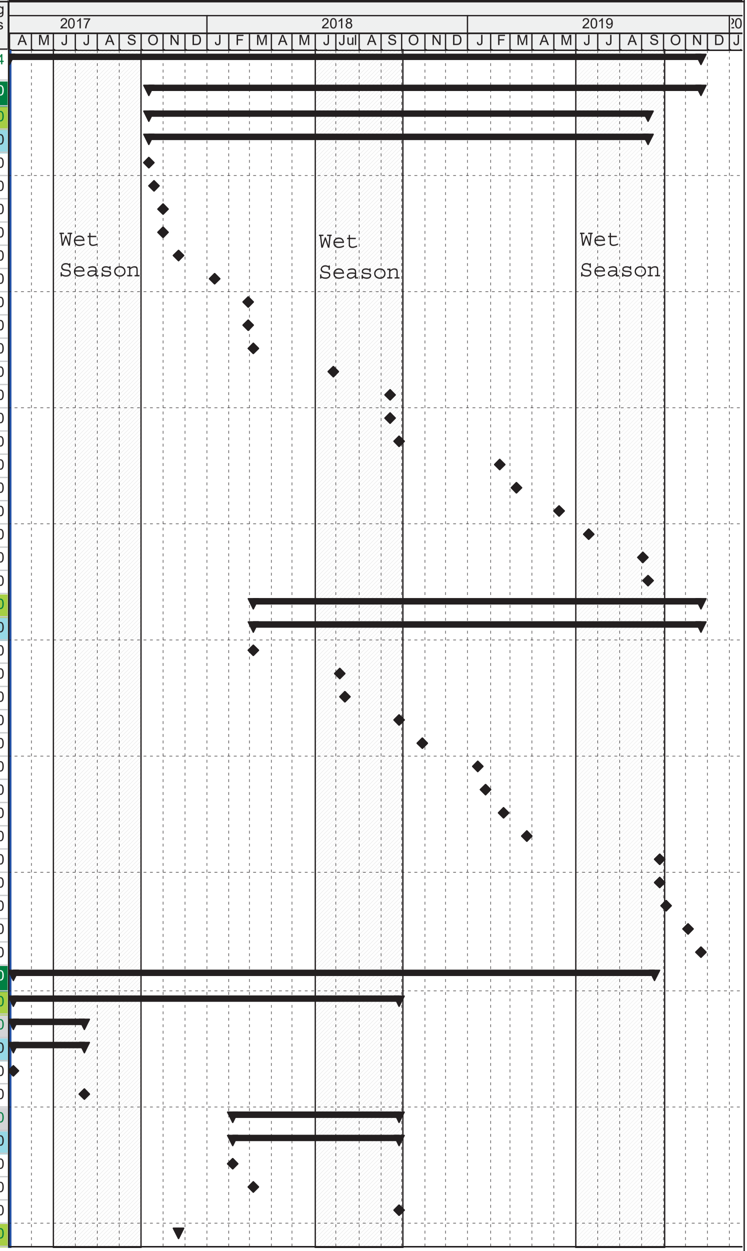
30-Mar-17 11:00

PROJECT: **Tulu Kapi Gold Project** - Kefi Minerals

Proposal: **KEFI P3540_D1**

DRAFT

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
Tulu Kapi Gold Project - Preliminary PEP_Water Infarstructure Development		664	01-Apr-17	21-Nov-19	0	1073140.4
PROJECT MILESTONES		531	11-Oct-17	21-Nov-19	0	0.0
CLIENT INTERFACES		479	11-Oct-17	09-Sep-19	34	0.0
Owners		479	11-Oct-17	09-Sep-19	34	0.0
KGP-IN-2620	WTP & STP Operators Mobilised (Vendor Training for Operations and Maintenance)	0	11-Oct-17		334	0.0
KGP-IN-1580	STP & WTP Installed, Commissioned - Potable Water at Temporary Camp Available	0	19-Oct-17		156	0.0
KGP-IN-1040	Temporary Construction Camp & Communications Available for Use	0	31-Oct-17		313	0.0
KGP-IN-2580	Emergency Response & Medical Services In Place	0	31-Oct-17		313	0.0
KGP-IN-1000	EPC Contract Award	0	23-Nov-17*		0	0.0
KGP-IN-1010	Contract Executed	0		11-Jan-18	59	0.0
KGP-IN-1020	Sand & Aggregate Required On Site	0		28-Feb-18	194	0.0
KGP-IN-2550	Borrow Areas for Structural Fill Identified and Available	0		28-Feb-18	194	0.0
KGP-IN-1540	EPC Access to Site Available	0	07-Mar-18		18	0.0
KGP-IN-2630	Construction Fuel Supply Available On Site	0	26-Jun-18		85	0.0
KGP-IN-1030	Plant Earthworks Complete *Full & Unimpeded Access to CIL & Milling Area's Req'd	0	13-Sep-18		3	0.0
KGP-IN-1600	Site Security Services & Fencing in Place	0	13-Sep-18		3	0.0
KGP-IN-1050	Buildings Contractor Mobilisation	0	27-Sep-18		281	0.0
KGP-IN-1060	SAG Mill On Site	0		14-Feb-19	97	0.0
KGP-IN-1080	Permanent Power Available	0	10-Mar-19		226	0.0
KGP-IN-1110	TSF Available for Start Up	0		07-May-19	200	0.0
KGP-IN-1070	First Ore Available by Client	0	18-Jun-19		136	0.0
KGP-IN-1090	Raw Water Available for Plant commissioning	0	02-Sep-19		15	0.0
KGP-IN-1100	Plant First Fills Delivered to Site	0		09-Sep-19	49	0.0
EPC		432	07-Mar-18	21-Nov-19	0	0.0
All Disciplines		432	07-Mar-18	21-Nov-19	0	0.0
KGP-IN-1130	EPC Commence Mobilization (Early Accommodation Req'd)	0	07-Mar-18		18	0.0
KGP-IN-1120	Design Review	0		05-Jul-18	173	0.0
KGP-IN-1150	Hazop	0		12-Jul-18	168	0.0
KGP-IN-1510	Plant Civil's Mobilisation (Site Establishment & Batchplant Setup)	0	27-Sep-18		22	0.0
KGP-IN-9030	Initial Construction Accommodation at Main Camp (50% Occupancy Available)	0		29-Oct-18	143	0.0
KGP-IN-9035	Accommodation & Common Camp Buildings Ready for use (100% Occupancy)	0		14-Jan-19*	134	0.0
KGP-IN-1140	Tank Installation Mobilisation	0	25-Jan-19		94	0.0
KGP-IN-1160	SMP Contractor Mobilisation	0	19-Feb-19		29	0.0
KGP-IN-1170	Plant Site Electrical Team Mobilisation	0	24-Mar-19		110	0.0
KGP-IN-1180	SMP Complete	0		26-Sep-19	41	0.0
KGP-IN-1190	Electrical Complete	0		26-Sep-19	41	0.0
KGP-IN-1200	Final Facility Practical Completion	0		05-Oct-19	56	0.0
KGP-IN-1220	First Gold Pour	0		04-Nov-19	51	0.0
KGP-IN-1210	Commissioning/Performance Testing Complete	0		21-Nov-19	0	0.0
OWNERS		615	06-Apr-17	17-Sep-19	46	0.0
APPROVALS		370	06-Apr-17	27-Sep-18	87	0.0
Internal		66	06-Apr-17	13-Jul-17	80	0.0
Owners		66	06-Apr-17	13-Jul-17	80	0.0
KGP-IN-2640	Approval to proceed with Early Works Design, Procurement and Infrastructure Development	0	06-Apr-17*		0	0.0
KGP-IN-1530	Full Financial Investment Decision	0	13-Jul-17*		80	0.0
Environmental, Regulatory & Ministerial		161	06-Feb-18	27-Sep-18	87	0.0
Owners		161	06-Feb-18	27-Sep-18	87	0.0
KGP-IN-2600	In Country Tax Agreements Established	0	06-Feb-18		49	0.0
KGP-IN-2440	All Environmental & Building Permits in Place	0	07-Mar-18		18	0.0
KGP-IN-2490	Plantsite Facilities Permits & Licensing In Place	0	27-Sep-18		131	0.0
EPC DESIGN INPUTS		0	22-Nov-17	23-Nov-17	0	0.0



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Preliminary Baseline Schedule Development

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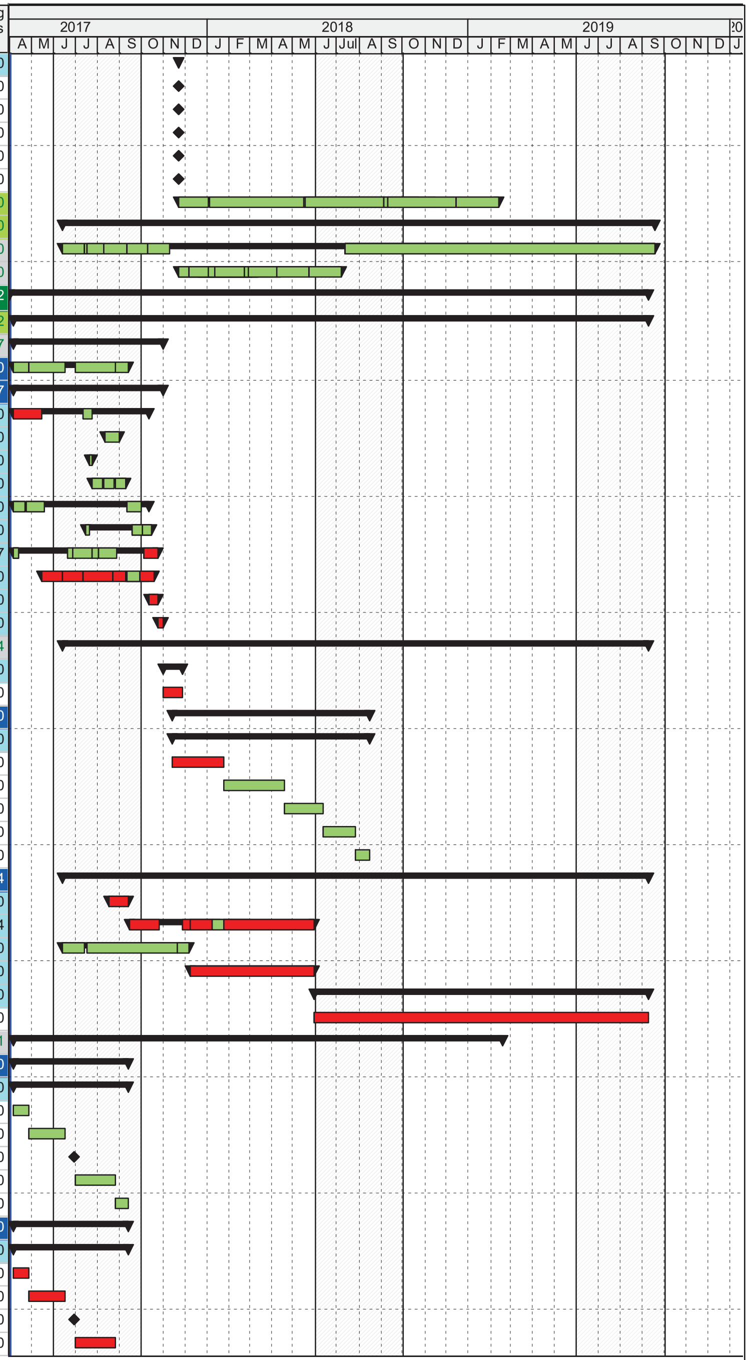
Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
Owners		0	22-Nov-17	23-Nov-17	0	0.0
KGP-IN-2120	Site Geotechnical Data	0		22-Nov-17	0	0.0
KGP-IN-2130	Topographical Survey	0		22-Nov-17	0	0.0
KGP-IN-2140	Hydrological Study	0		22-Nov-17	0	0.0
KGP-IN-2160	Environmental Study	0		22-Nov-17	0	0.0
KGP-IN-2150	MET Testwork	0		23-Nov-17	0	0.0
400 - Mining		305	23-Nov-17	12-Feb-19	126	0.0
600 - Owners Project Costs		570	14-Jun-17	17-Sep-19	46	0.0
620 - Plant Pre-Production		570	14-Jun-17	17-Sep-19	46	0.0
670 - Plant Mobile Equipment		153	23-Nov-17	07-Jul-18	174	0.0
PHASE 1 - EARLY WORKS - PROJECT DEVELOPMENT		611	01-Apr-17	09-Sep-19	53	159854.2
EPCM Project Development		608	06-Apr-17	09-Sep-19	0	159854.2
000 - Site Establish		143	06-Apr-17	31-Oct-17	412	18576.7
058 - Surveying		111	06-Apr-17	13-Sep-17	49	1947.0
060 - Construction Accomodation (Exploration Camp Upgrade)		143	06-Apr-17	31-Oct-17	412	16629.7
All Disciplines		130	06-Apr-17	11-Oct-17	112	336.0
Owners		14	11-Aug-17	31-Aug-17	37	0.0
Earthworks		3	20-Jul-17	25-Jul-17	6	260.0
Civils		33	25-Jul-17	09-Sep-17	7	2576.0
Mechanical		130	06-Apr-17	11-Oct-17	112	2315.0
Piping		65	15-Jul-17	16-Oct-17	109	739.0
Electrical & Instrumentation		139	06-Apr-17	24-Oct-17	417	2573.7
Buildings & Architectural		111	16-May-17	19-Oct-17	0	6930.0
Infrastructure		9	11-Oct-17	24-Oct-17	0	100.0
Commissioning		5	24-Oct-17	31-Oct-17	0	800.0
300 - Infrastructure		563	14-Jun-17	09-Sep-19	0	81127.4
Earthworks		20	31-Oct-17	28-Nov-17	0	0.0
KGP-IN-13640	Mobilise Early Works Bulk EW Contractor	30	31-Oct-17	28-Nov-17	0	0.0
310 - Public Roads, Site Roads & Tracks		189	13-Nov-17	16-Aug-18	130	30117.0
Earthworks		189	13-Nov-17	16-Aug-18	130	30117.0
KGP-IN-11610	Access Road to TSF & Storage Dams	68	13-Nov-17	24-Jan-18	0	7170.0
KGP-IN-11600	Main Access Road to Plant	86	24-Jan-18*	18-Apr-18	36	10033.0
KGP-IN-11620	Access Road to Permanent Camp	64	18-Apr-18	12-Jun-18	183	6020.0
KGP-IN-11640	Main Access Road Intersection	52	12-Jun-18*	27-Jul-18	203	3244.0
KGP-IN-11650	Capping / Sealing of Main Access Roads - *Ready For Heavy Road Transport	23	27-Jul-18	16-Aug-18*	203	3650.0
330 - Water Supply (Water Storage Dams)		563	14-Jun-17	09-Sep-19	0	51010.4
Owners		20	17-Aug-17	13-Sep-17	3	368.0
Earthworks		176	14-Sep-17	30-May-18	0	45843.4
Mechanical		126	14-Jun-17	07-Dec-17	162	880.0
Piping		115	08-Dec-17	30-May-18	0	3919.0
Infrastructure		322	30-May-18	09-Sep-19	0	0.0
KGP-IN-13630	Water Storage Dams Ready For Use (Commissioned & Commence Water Storage)	525	30-May-18*	09-Sep-19	0	0.0
530 - Specialist Consultants		468	06-Apr-17	18-Feb-19	135	60150.1
532 - Environmental		111	06-Apr-17	13-Sep-17	49	4468.0
All Disciplines		111	06-Apr-17	13-Sep-17	49	4468.0
KGP-IN-10340	Prepare Environmental Investigation Agreement & Scope	13	06-Apr-17	27-Apr-17	15	0.0
KGP-IN-10580	Tender Environmental Testwork	35	28-Apr-17	16-Jun-17	15	0.0
KGP-IN-10640	Award Environmental Study Contract	0	29-Jun-17		15	0.0
KGP-IN-10480	Carry Out Environmental Testwork & Submit Report RevA	60	30-Jun-17	25-Aug-17	24	4468.0
KGP-IN-10540	Submit Environmental Report Rev0	20	25-Aug-17	13-Sep-17	75	0.0
533 - Geotechnical		111	06-Apr-17	13-Sep-17	3	4946.0
All Disciplines		111	06-Apr-17	13-Sep-17	3	4946.0
KGP-IN-9380	Prepare Geotechnical Investigation Agreement & Scope	13	06-Apr-17	27-Apr-17	2	0.0
KGP-IN-9970	Tender Geotechnical Testwork	35	28-Apr-17	16-Jun-17	2	0.0
KGP-IN-10320	Award Geotechnical Study Contract	0	29-Jun-17		2	0.0
KGP-IN-9910	Carry Out Geotechnical Testwork & Submit Report RevA	60	30-Jun-17	25-Aug-17	4	4946.0



Remaining Level of Effort
Actual Work
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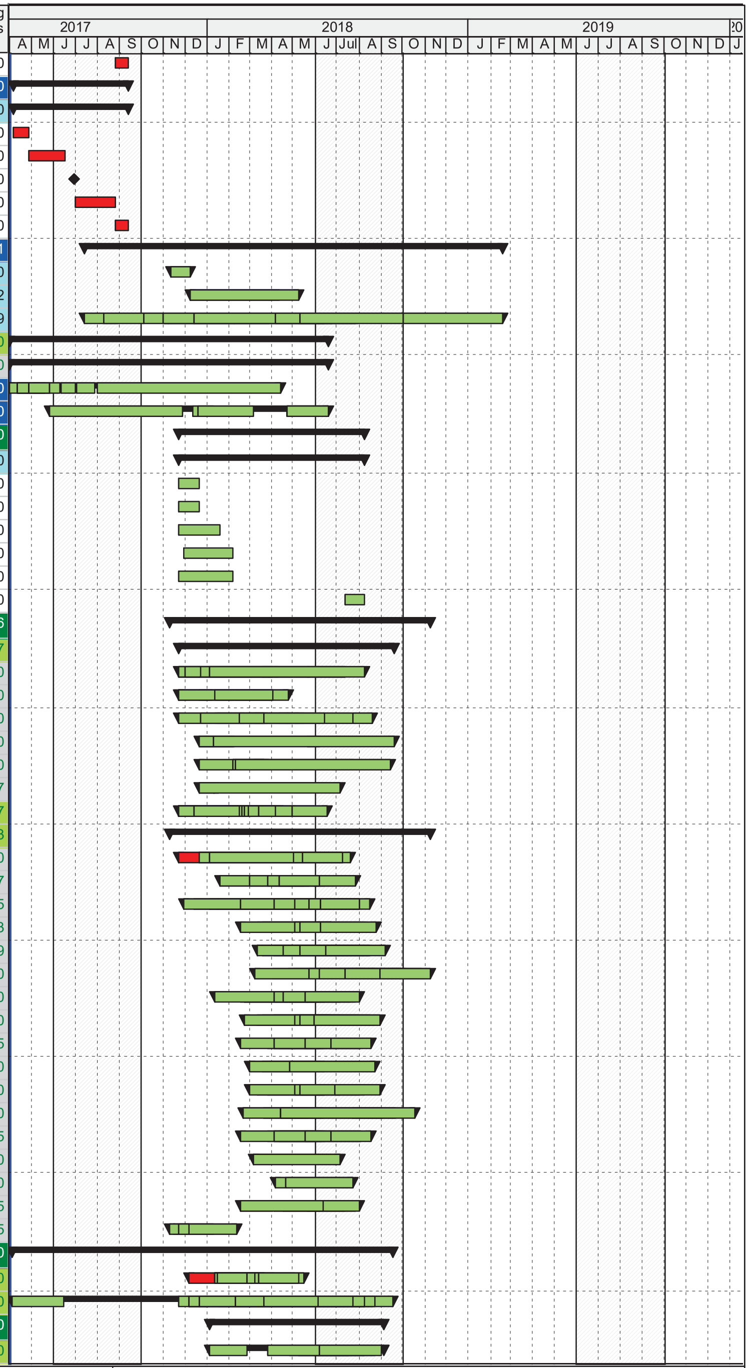
Milestone
Summary

Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
KGP-IN-9950	Submit Geotechnical Report Rev0	20	25-Aug-17	13-Sep-17	4	0.0
534 - Hydrology		111	06-Apr-17	13-Sep-17	3	4946.0
All Disciplines		111	06-Apr-17	13-Sep-17	3	4946.0
KGP-IN-9050	Prepare Hydrology Investigation Agreement & Scope	13	06-Apr-17	27-Apr-17	2	0.0
KGP-IN-9060	Tender Hydrology Testwork	35	28-Apr-17	16-Jun-17	2	0.0
KGP-IN-9070	Award Hydrology Study Contract	0	29-Jun-17		2	0.0
KGP-IN-9080	Carry Out Hydrology Testwork & Submit Report RevA	60	30-Jun-17	25-Aug-17	4	4946.0
KGP-IN-9120	Submit Hydrology Report Rev0	20	25-Aug-17	13-Sep-17	4	0.0
536 - HV Electrical		402	13-Jul-17	18-Feb-19	135	45790.1
Earthworks		20	11-Nov-17	09-Dec-17	30	2120.0
Civils		100	09-Dec-17	09-May-18	167	8078.2
Electrical & Instrumentation		402	13-Jul-17	18-Feb-19	135	35591.9
KEFI Project Develpoment		303	01-Apr-17	19-Jun-18	361	0.0
660 - Community		303	01-Apr-17	19-Jun-18	361	0.0
663 - Land Acquisition		258	01-Apr-17	13-Apr-18	362	0.0
665 - Housing & Relocation		267	26-May-17	19-Jun-18	361	0.0
PROJECT RAMP UP		177	23-Nov-17	09-Aug-18	324	1096.0
EPC		177	23-Nov-17	09-Aug-18	324	1096.0
KGP-IN-4030	PLN-003 - Engineering Plan	20	23-Nov-17	20-Dec-17	30	128.0
KGP-IN-4040	PLN-004 - Construction Management Plan	20	23-Nov-17	20-Dec-17	30	160.0
KGP-IN-4060	PLN-006 - Project Quality Management Plan	35	23-Nov-17	18-Jan-18	15	208.0
KGP-IN-4070	PLN-005 - Project Health and Safety Management Plan	31	30-Nov-17	05-Feb-18	14	160.0
KGP-IN-4050	PLN-001 - Project Execution Plan	38	23-Nov-17	06-Feb-18	13	280.0
KGP-IN-4080	PLN-007 - Process Commissioning Plan	20	13-Jul-18	09-Aug-18	327	160.0
ENGINEERING, SPECIFICATIONS & DRAFTING		252	09-Nov-17	09-Nov-18	259	58970.6
Engineering Deliverables		205	23-Nov-17	19-Sep-18	296	17169.7
Process		177	23-Nov-17	09-Aug-18	324	3592.0
Civil/ Structural		102	23-Nov-17	24-Apr-18	88	1200.0
Mechanical/ Piping		183	23-Nov-17	20-Aug-18	269	4448.0
Electrical		185	21-Dec-17	19-Sep-18	232	2712.0
Instrumentation		182	21-Dec-17	13-Sep-18	225	4144.0
Infrastructure		132	21-Dec-17	05-Jul-18	329	1073.7
Engineering Datasheets/ Specifications		139	23-Nov-17	18-Jun-18	256	6166.7
Drafting		252	09-Nov-17	09-Nov-18	239	35634.3
110 - Treatment plant General		162	23-Nov-17	19-Jul-18	173	3285.0
120 - Feed Preparation		129	19-Jan-18	26-Jul-18	304	2769.7
130 - Milling		177	30-Nov-17	16-Aug-18	289	10025.5
140 - Feed Screening / Thickening		130	16-Feb-18	24-Aug-18	294	1321.3
160 - Leaching (CIL)		125	12-Mar-18	06-Sep-18	253	1914.9
170 - Elution & Goldroom		170	09-Mar-18	09-Nov-18	235	3670.0
180 - Tails Handling		139	12-Jan-18	02-Aug-18	304	1490.0
210 - Reagents		130	23-Feb-18	30-Aug-18	256	1320.0
220 - Water Services		125	16-Feb-18	17-Aug-18	262	1781.5
230 - Plant Services		120	02-Mar-18	23-Aug-18	155	1115.0
240 - Air Services		125	02-Mar-18	30-Aug-18	282	473.0
260 - Electrical Services		166	20-Feb-18	17-Oct-18	203	2968.0
330 - Water & Sewerage		125	16-Feb-18	17-Aug-18	286	1781.5
350 - Tailings dam		83	07-Mar-18	05-Jul-18	93	0.0
340 - Power Supply		75	06-Apr-18	23-Jul-18	232	560.0
370 - Buildings-Plant		113	16-Feb-18	01-Aug-18	98	598.5
380 - Permanent Accomodation		63	09-Nov-17	12-Feb-18	248	560.5
PROCUREMENT		366	03-Apr-17	17-Sep-18	298	23440.0
Long lead Items		107	07-Dec-17	16-May-18	194	5200.0
Standard		366	03-Apr-17	17-Sep-18	298	18240.0
CONTRACTS		167	05-Jan-18	05-Sep-18	306	0.0
Site Construction (tender & award)		167	05-Jan-18	05-Sep-18	306	0.0



Remaining Level of Effort
Actual Work
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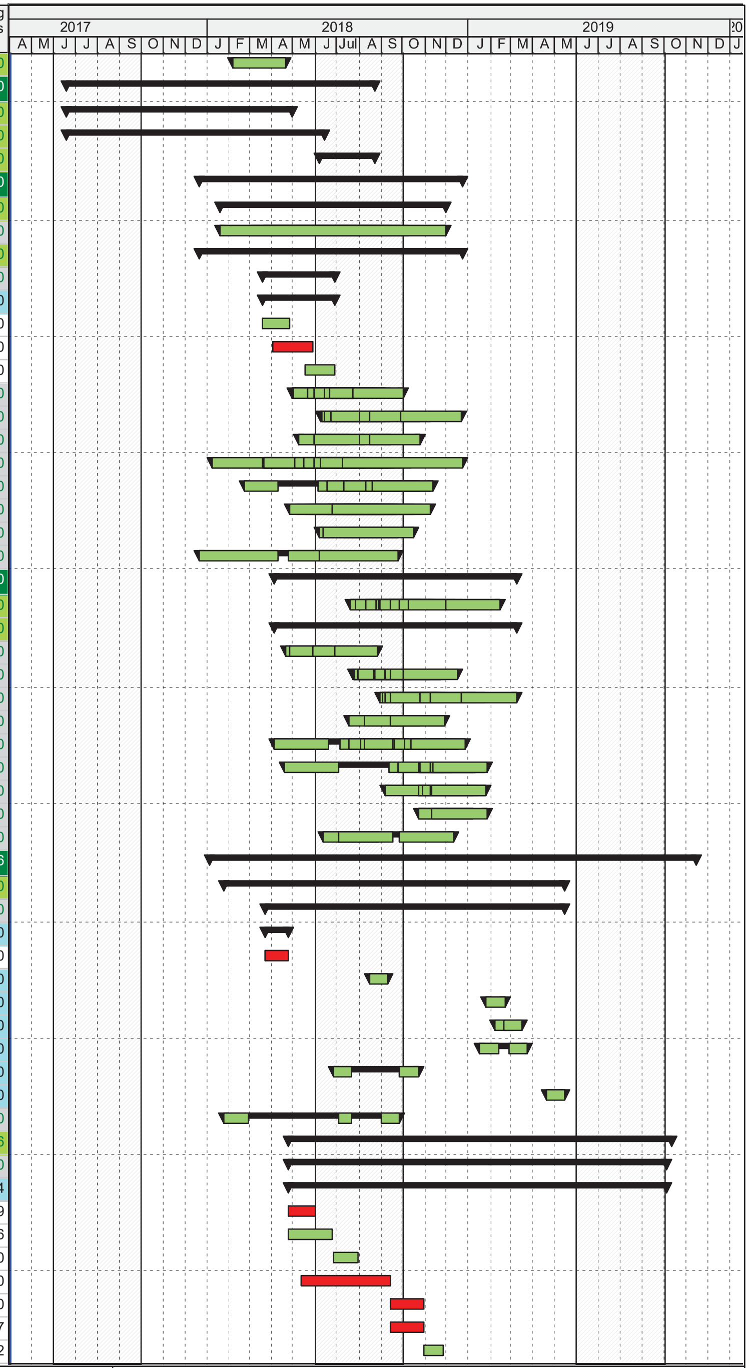
Summary

Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
Off Shore Services (tender & award)		50	06-Feb-18	20-Apr-18	30	0.0
VENDOR DATA		298	19-Jun-17	23-Aug-18	211	0.0
Long Lead		216	19-Jun-17	30-Apr-18	173	0.0
F - Mechanical		248	19-Jun-17	14-Jun-18	178	0.0
H - Electrical		55	07-Jun-18	23-Aug-18	211	0.0
MANUFACTURE & FABRICATION		252	21-Dec-17	24-Dec-18	176	43109.0
Long Lead Items		218	19-Jan-18	29-Nov-18	132	10256.0
F - Mechanical		218	19-Jan-18	29-Nov-18	132	10256.0
Standard		252	21-Dec-17	24-Dec-18	176	32853.0
C - Concrete		68	20-Mar-18	27-Jun-18	148	720.0
Civils		68	20-Mar-18	27-Jun-18	148	720.0
KGP-IN-6880	Civil Reo Bar Supply	25	20-Mar-18	25-Apr-18	29	240.0
KGP-IN-6890	Milling Area 132 Manufacture Cast in Items Supply	40	03-Apr-18	29-May-18	5	240.0
KGP-IN-6900	Refining Area 180 Cast in Items Supply	30	17-May-18	27-Jun-18	152	240.0
D - Structural		108	30-Apr-18	01-Oct-18	235	7800.0
E - Platework		140	08-Jun-18	21-Dec-18	176	3829.0
Tanks		119	09-May-18	25-Oct-18	172	960.0
F - Mechanical		243	08-Jan-18	24-Dec-18	136	8160.0
G - Piping		180	23-Feb-18	12-Nov-18	164	3216.0
H - Electrical		140	26-Apr-18	09-Nov-18	137	6440.0
J - Instrumentation		93	06-Jun-18	15-Oct-18	160	888.0
M - Buildings		189	21-Dec-17	25-Sep-18	95	840.0
TRANSPORT		235	04-Apr-18	09-Mar-19	179	43629.0
Long Lead Items		145	19-Jul-18	14-Feb-19	137	6832.0
Standard		235	04-Apr-18	09-Mar-19	179	36797.0
C - Concrete		90	20-Apr-18	27-Aug-18	145	2240.0
D - Structural		104	23-Jul-18	17-Dec-18	234	7800.0
E - Platework		130	31-Aug-18	09-Mar-19	179	3717.0
Tanks		94	18-Jul-18	29-Nov-18	203	2240.0
F - Mechanical		187	04-Apr-18	27-Dec-18	188	5600.0
G - Piping		197	18-Apr-18	27-Jan-19	167	4480.0
H - Electrical		97	06-Sep-18	25-Jan-19	135	7280.0
J - Instrumentation		66	23-Oct-18	26-Jan-19	144	2240.0
M - Buildings		129	12-Jun-18	11-Dec-18	50	1200.0
CONSTRUCTION		469	04-Jan-18	14-Nov-19	5	740993.6
000 - Site Wide		325	24-Jan-18	15-May-19	82	1320.0
Mobilisation		285	23-Mar-18	15-May-19	82	0.0
Earthworks		20	23-Mar-18	24-Apr-18	0	0.0
KGP-IN-12850	Mobilise Plantsite Bulk EW Contractor	30	23-Mar-18	24-Apr-18	0	0.0
Civils		18	15-Aug-18	10-Sep-18	4	0.0
Platework		18	25-Jan-19	21-Feb-19	54	0.0
Mechanical		27	06-Feb-19	16-Mar-19	35	0.0
Electrical & Instrumentation		46	16-Jan-19	24-Mar-19	81	0.0
Buildings & Architectural		84	26-Jun-18	23-Oct-18	56	0.0
Mining		16	19-Apr-19	15-May-19	82	0.0
Site Establishment		168	24-Jan-18	27-Sep-18	4	1320.0
100 - PROCESS PLANT		370	24-Apr-18	12-Oct-19	29	455107.6
110 - Treatment plant General		365	24-Apr-18	05-Oct-19	15	53309.0
Earthworks		365	24-Apr-18	05-Oct-19	15	44703.4
KGP-IN-8610	Plant Site Clear & Grub	45	24-Apr-18*	01-Jun-18	0	1275.9
KGP-IN-8640	Plantsite Security Fencing	73	24-Apr-18*	25-Jun-18*	85	1322.6
KGP-IN-8630	Plantsite Sediment Controls Structures	40	26-Jun-18*	30-Jul-18	108	1365.0
KGP-IN-8680	Bulk Site Earthworks	143	13-May-18	13-Sep-18	0	21118.0
KGP-IN-8730	In-plant Roads	56	13-Sep-18	31-Oct-18	0	2425.0
KGP-IN-8700	Site Drainage & Culverts	56	13-Sep-18	31-Oct-18	0	6103.7
KGP-IN-8660	Treatment Plant General Misc Detailed Earthworks (Car Parks & Hardstands etc)	30	31-Oct-18*	26-Nov-18	9	3662.2



Remaining Level of Effort
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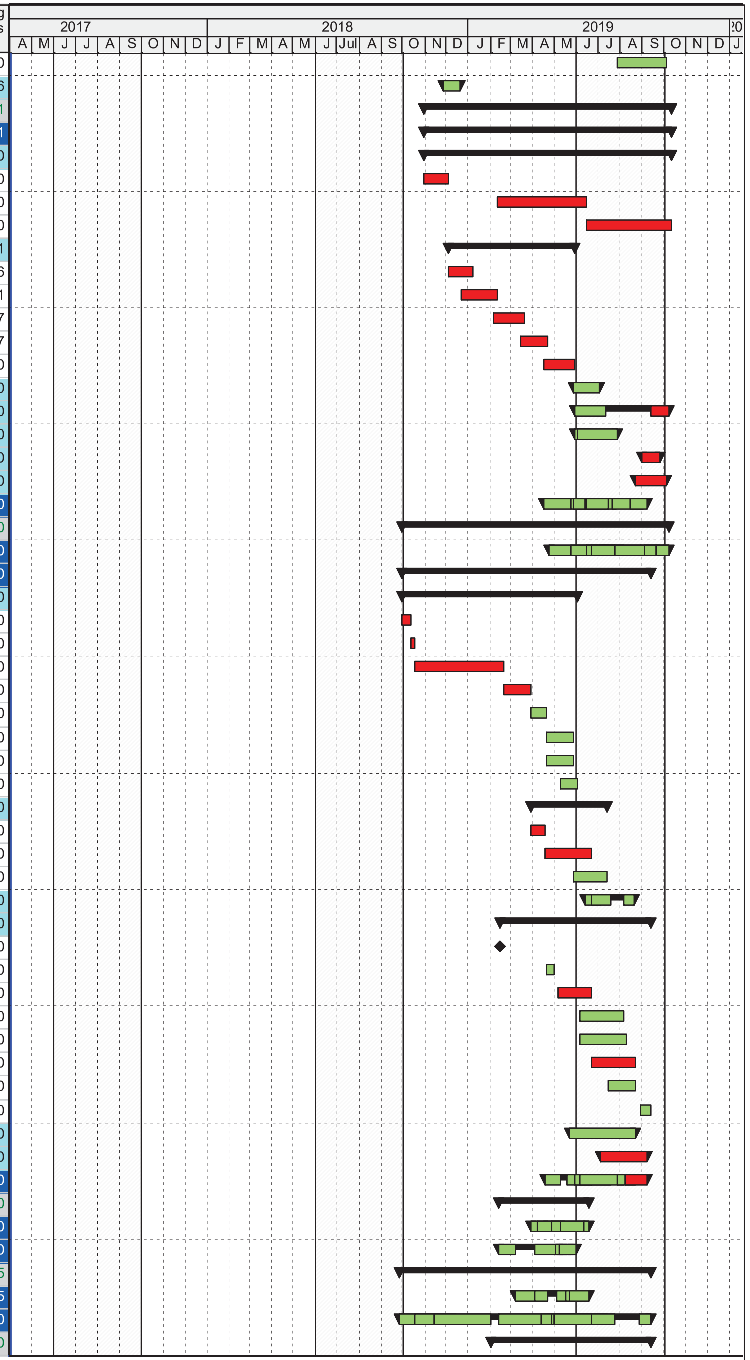
Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)			
Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
KGP-IN-8670	Site Improvements & Rehab (Foundation Remediation)	80	28-Jul-19*	05-Oct-19*	26	7431.0
Civils		17	26-Nov-18	19-Dec-18	10	8605.6
120 - Feed Preparation		237	31-Oct-18	12-Oct-19	0	103316.1
121 - Primary Crushing		237	31-Oct-18	12-Oct-19	0	97367.1
Earthworks		237	31-Oct-18	12-Oct-19	0	7961.0
KGP-IN-8970	Crushing & Stockpiling Facility Detailed Earthworks	39	31-Oct-18*	04-Dec-18	0	1161.0
KGP-IN-8800	Crushing Chamber & Walls Backfill (Est)	143	10-Feb-19	14-Jun-19	0	6400.0
KGP-IN-8870	ROM Pad - Client	140	14-Jun-19	12-Oct-19	0	400.0
Civils		118	04-Dec-18	29-May-19	2	62332.1
KGP-IN-8740	Raft Concrete	25	04-Dec-18	07-Jan-19	0	8605.6
KGP-IN-8750	First Lift & Suspended Slab	44	21-Dec-18	10-Feb-19	0	12081.1
KGP-IN-8760	Second Lift & Suspended Slab	50	05-Feb-19	20-Mar-19	5	14521.7
KGP-IN-8770	Third Lift & Suspended Slab	44	14-Mar-19	21-Apr-19	5	12254.7
KGP-IN-8780	Fourth Lift & Suspended Slab	50	16-Apr-19	29-May-19	5	14869.0
Structural Steel		26	27-May-19	03-Jul-19	28	3929.0
Platework		90	29-May-19	07-Oct-19	0	12674.0
Mechanical		41	29-May-19	27-Jul-19	41	5428.0
Piping		19	30-Aug-19	26-Sep-19	0	1134.0
Electrical & Instrumentation		31	22-Aug-19	05-Oct-19	0	3909.0
125 - Stockpiling		99	16-Apr-19	06-Sep-19	19	5949.0
130 - Milling		255	30-Sep-18	07-Oct-19	34	155550.0
131 - Reclaim / Surge Bin		115	23-Apr-19	07-Oct-19	34	21087.0
132 - Grinding		241	30-Sep-18	13-Sep-19	17	127845.0
Civils		167	30-Sep-18	01-Jun-19	70	79429.0
KGP-IN-9530	Excavation	15	30-Sep-18	13-Oct-18	3	485.0
KGP-IN-9540	Blinding	6	13-Oct-18	18-Oct-18	3	1150.0
KGP-IN-9550	Concrete Base & Structure	126	18-Oct-18	19-Feb-19	3	48755.0
KGP-IN-9570	Mechanical Plinths & Apron Slabs	44	19-Feb-19	28-Mar-19	3	12629.0
KGP-IN-9580	Drive In Sump	24	28-Mar-19	19-Apr-19	31	6846.0
KGP-IN-9430	Grinding & Classification Area Concrete	44	19-Apr-19	27-May-19	31	6466.0
KGP-IN-11240	CV-02 Mill Feed Concrete	44	19-Apr-19	27-May-19	31	1812.0
KGP-IN-9250	Lime Silo Civils	26	09-May-19	01-Jun-19	116	1286.0
Structural Steel		72	28-Mar-19	13-Jul-19	19	9495.0
KGP-IN-9390	Grinding Area Mill Access Steel	22	28-Mar-19	17-Apr-19	3	1234.0
KGP-IN-13450	Mill Building Structural Steel	78	17-Apr-19	22-Jun-19	3	5707.0
KGP-IN-9480	CV-02 LLM's, Trestles, Trusses & Take Up Steelwork	55	27-May-19	13-Jul-19	31	2554.0
Platework		48	13-Jun-19	20-Aug-19	25	926.0
Mechanical		147	14-Feb-19	13-Sep-19	17	17842.0
KGP-IN-9560	SAG Mill Onsite	0	14-Feb-19		97	0.0
KGP-IN-9590	Set packers, base plates & Survey	13	19-Apr-19	30-Apr-19	66	443.0
KGP-IN-9600	Set Up and Pre-Assmbley of Mill Components	55	06-May-19	22-Jun-19	3	3911.0
KGP-IN-13550	Milling Area Mechanical Equipment Installation	70	05-Jun-19	05-Aug-19	30	1638.0
KGP-IN-9510	CV-02 Area Mechanical Equipment Installation	74	06-Jun-19	09-Aug-19	31	5140.0
KGP-IN-9620	Install SAG Mill	70	22-Jun-19	22-Aug-19	3	3115.0
KGP-IN-9610	Install main lubrication units and tubing	44	16-Jul-19	22-Aug-19	22	2935.0
KGP-IN-9300	Lime Silo Pkg & Hoist Installation	18	29-Aug-19	13-Sep-19	30	660.0
Piping		67	21-May-19	22-Aug-19	10	13207.0
Electrical & Instrumentation		46	05-Jul-19	08-Sep-19	1	6946.0
133 - Classification		99	17-Apr-19	08-Sep-19	1	6618.0
140 - Feed Screening & Thickening		85	12-Feb-19	17-Jun-19	89	6869.0
141 - Trash Screening		52	29-Mar-19	17-Jun-19	88	2673.0
142 - Feed Thickening (Not in Estimate TBC)		74	12-Feb-19	31-May-19	100	4196.0
160 - Leaching		242	27-Sep-18	12-Sep-19	26	90658.5
161 - Pre-Leach (Not in Estimate TBC)		69	07-Mar-19	17-Jun-19	89	6492.5
162 - CIL		242	27-Sep-18	12-Sep-19	25	84166.0
170 - Elution & Gold Room		155	01-Feb-19	12-Sep-19	29	26152.0



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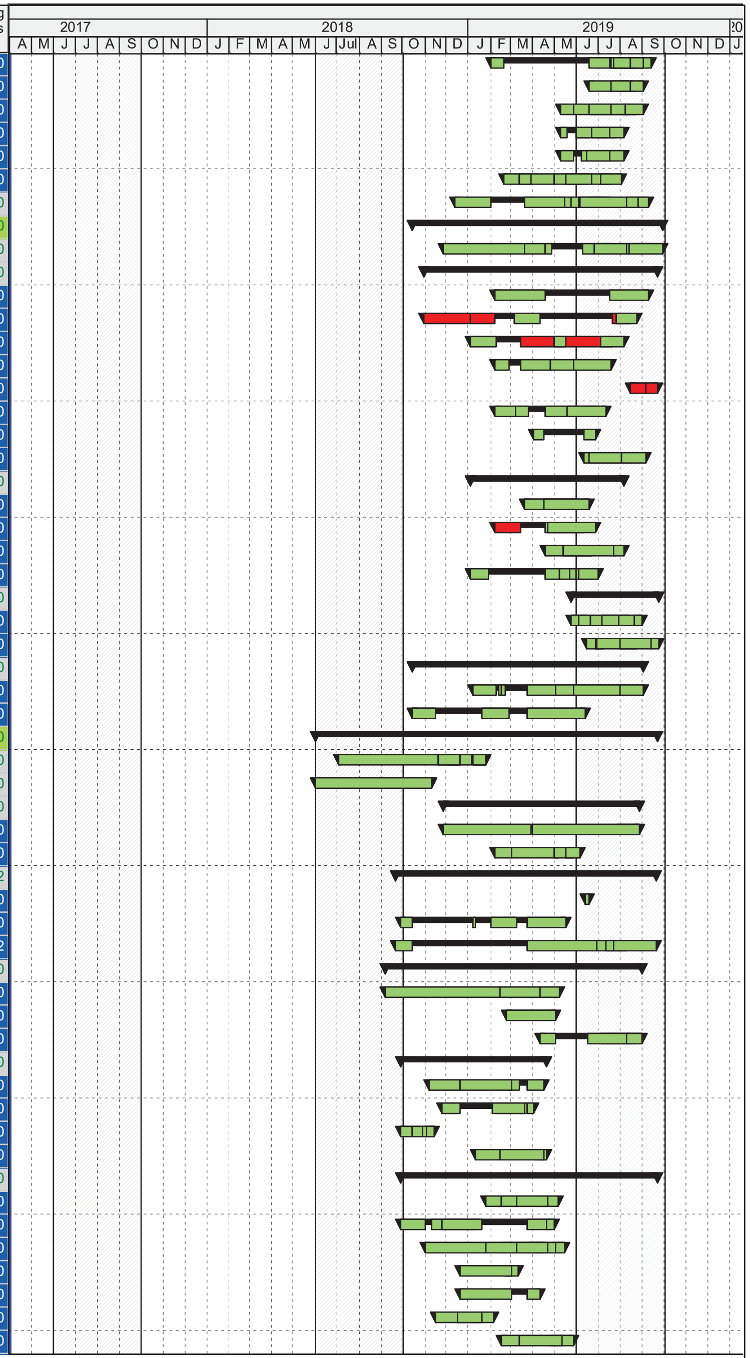
Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)

Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH

Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
171 - Carbon Recovery		155	01-Feb-19	12-Sep-19	28	3069.0
172 - Acid Wash		54	17-Jun-19	02-Sep-19	37	1012.0
173 - Elution		79	10-May-19	02-Sep-19	37	5310.0
174 - Carbon Regeneration		60	10-May-19	05-Aug-19	56	3033.0
176 - Electrowinning		60	10-May-19	05-Aug-19	56	2872.0
177 - Goldroom & Smelting		113	19-Feb-19	01-Aug-19	58	10856.0
180 - Tails Handling		184	13-Dec-18	09-Sep-19	38	19253.0
200 - REAGENTS & PLANT SERVICES		241	14-Oct-18	28-Sep-19	38	66026.0
210 - Reagents		210	26-Nov-18	28-Sep-19	17	20842.0
220 - Water Services		223	31-Oct-18	21-Sep-19	26	19502.0
221 - Water Services - General		146	07-Feb-19	08-Sep-19	34	1256.0
222 - Raw Water		203	31-Oct-18	24-Aug-19	12	3278.0
223 - Process Water		147	03-Jan-19	06-Aug-19	49	4723.0
224 - Potable Water		111	07-Feb-19	19-Jul-19	60	3901.0
225 - Gland Water		26	15-Aug-19	21-Sep-19	1	556.0
226 - Cooling Water		105	07-Feb-19	11-Jul-19	66	2142.0
227 - Treated Water		59	01-Apr-19	27-Jun-19	78	198.0
228 - Fire Water		61	11-Jun-19	05-Sep-19	38	3448.0
230 - Plant Services		145	03-Jan-19	05-Aug-19	59	16017.0
231 - Piperacks		60	20-Mar-19	18-Jun-19	38	6299.0
232 - Water Treatment		94	07-Feb-19	27-Jun-19	78	2969.0
233 - Sewage Treatment		72	18-Apr-19	05-Aug-19	24	4770.0
234 - Process Water Pond		120	03-Jan-19	30-Jun-19	84	1979.0
240 - Air Services		87	23-May-19	24-Sep-19	41	4003.0
241 - Compressed Air		70	23-May-19	30-Aug-19	39	2310.0
242 - Blower Air		72	15-Jun-19	24-Sep-19	41	1693.0
260 - Electrical Services		222	14-Oct-18	02-Sep-19	43	5662.0
261 - Electrical Services General		164	07-Jan-19	02-Sep-19	43	3647.0
263 - Main Plant Substation		165	14-Oct-18	13-Jun-19	67	2015.0
300 - INFRASTRUCTURE		329	01-Jun-18	22-Sep-19	43	204749.0
310 - Infrastructure General		143	04-Jul-18	25-Jan-19	208	2651.0
320 - Sediment Control & Collection Structures		113	01-Jun-18	10-Nov-18	259	12033.0
330 - Water & Sewerage		188	26-Nov-18	28-Aug-19	44	10081.0
331 - Raw Water Supply		188	26-Nov-18	28-Aug-19	17	8743.0
333 - Water Treatment & Disposal		80	07-Feb-19	06-Jun-19	103	1338.0
340 - Power Supply		251	20-Sep-18	20-Sep-19	25	8812.2
341 - Mains Power		3	13-Jun-19	18-Jun-19	69	518.0
342 - HV Switchyard / Substation		158	27-Sep-18	17-May-19	90	1148.0
344 - Site Power Distribution		251	20-Sep-18	20-Sep-19	25	7146.2
350 - Tailings Dam		246	06-Sep-18	31-Aug-19	44	79563.0
351 - Tails Storage Facility		163	06-Sep-18	07-May-19	111	69734.0
352 - Tailings Pipeline		46	22-Feb-19	03-May-19	124	4293.0
353 - Decant Return		98	11-Apr-19	31-Aug-19	44	5536.0
360 - Buildings - Admin & Security		140	27-Sep-18	19-Apr-19	150	10894.0
361 - General Administration Building		110	07-Nov-18	16-Apr-19	153	2596.0
362 - First Aid Clinic		86	25-Nov-18	01-Apr-19	164	3111.0
363 - Main Entrance Gatehouse		34	27-Sep-18	14-Nov-18	82	511.0
364 - Plant Security Office / Changehouse		69	10-Jan-19	19-Apr-19	150	4676.0
370 - Plant Buildings		247	27-Sep-18	22-Sep-19	29	61240.0
371 - Plant Offices (No Allowance TBC)		66	25-Jan-19	05-May-19	128	1218.0
372 - Plant Workshop		146	27-Sep-18	01-May-19	131	9302.0
373 - Mine Warehouse / Buildings		129	02-Nov-18	14-May-19	122	22270.0
374 - Plant Ablutions, Change House, Meals		53	19-Dec-18	10-Mar-19	163	141.0
375 - Control Room		75	19-Dec-18	10-Apr-19	141	138.0
376 - MCC Buildings		53	15-Nov-18	04-Feb-19	101	2989.0
377 - Laboratory		68	16-Feb-19	28-May-19	63	6249.0



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Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)

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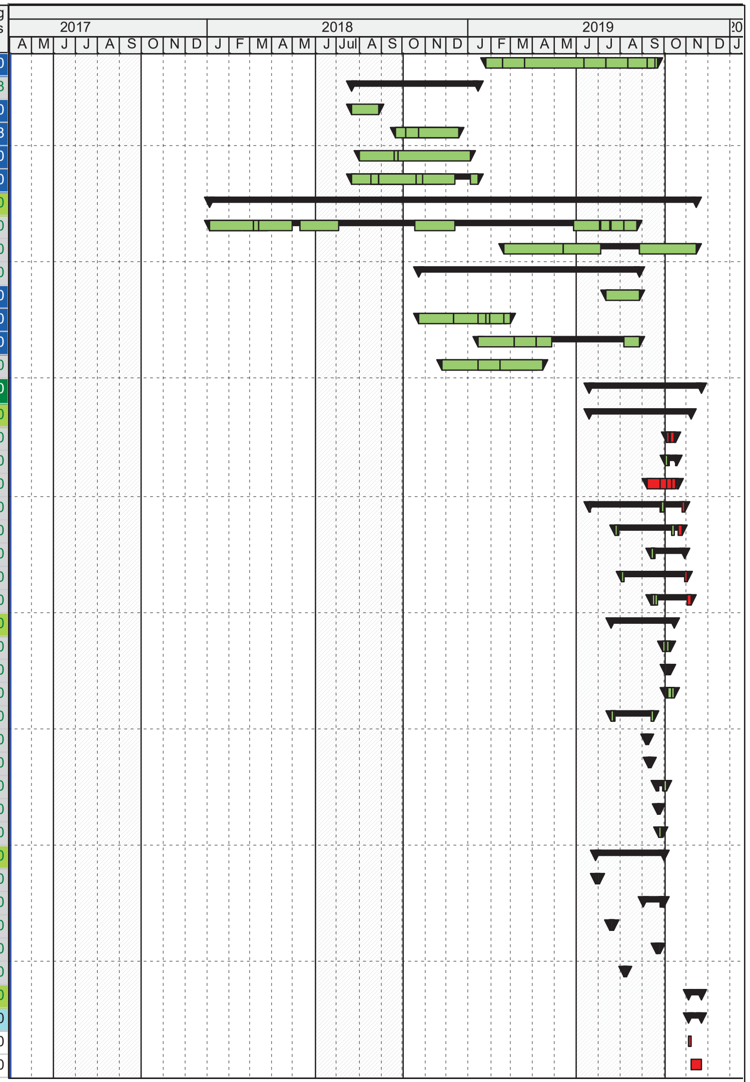
Activity ID	Activity Name	Remaining Duration	Start	Finish	Total Float	Remaining Labor Units
378 - Reagents Storage		165	25-Jan-19	22-Sep-19	29	18933.0
380 - Permanent Accomodation / Main Camp		122	22-Jul-18	14-Jan-19	216	19474.8
381 - Fencing & Security		26	22-Jul-18	28-Aug-18	119	1337.0
384 - Village Services		61	20-Sep-18	18-Dec-18	89	3300.8
385 - Electrical & Communications		106	02-Aug-18	03-Jan-19	224	1667.0
386 - Accomodation		122	22-Jul-18	14-Jan-19	79	13170.0
400 - MINE ESTABLISHMENT		469	04-Jan-18	14-Nov-19	5	13791.0
410 - Mining General		411	04-Jan-18	24-Aug-19	63	0.0
420 - Mine Establishment		186	19-Feb-19	14-Nov-19	5	0.0
450 - Mine Facilities		213	23-Oct-18	28-Aug-19	6	11817.0
451 - Mine Facilities General		34	11-Jul-19	28-Aug-19	6	1500.0
453 - HVM Workshop		88	23-Oct-18	28-Feb-19	104	7472.0
454 - Washdown Facility		157	14-Jan-19	28-Aug-19	6	2845.0
460 - Mine Mobile Equipment - HME		95	24-Nov-18	13-Apr-19	126	1974.0
COMMISSIONING		112	18-Jun-19	21-Nov-19	0	2048.0
100 - PROCESS PLANT		102	18-Jun-19	08-Nov-19	0	920.0
Primary Crushing		8	05-Oct-19	16-Oct-19	0	128.0
Surge Bin		12	03-Oct-19	19-Oct-19	0	80.0
Milling and Classification		29	08-Sep-19	21-Oct-19	0	112.0
Screening & Thickening		95	18-Jun-19	29-Oct-19	0	96.0
CIL		66	24-Jul-19	26-Oct-19	0	96.0
Desorption		33	12-Sep-19	30-Oct-19	0	200.0
Gold room		65	01-Aug-19	02-Nov-19	0	80.0
Carbon Regeneration		40	12-Sep-19	08-Nov-19	0	128.0
200 - REAGENTS & PLANT SERVICES		60	19-Jul-19	15-Oct-19	14	568.0
Reagents		6	28-Sep-19	09-Oct-19	18	96.0
Lime		5	03-Oct-19	10-Oct-19	17	72.0
Oxygen		8	03-Oct-19	15-Oct-19	14	56.0
Filtered Water		41	19-Jul-19	16-Sep-19	23	64.0
Fire water		3	05-Sep-19	09-Sep-19	38	48.0
Raw water distribution		5	08-Sep-19	13-Sep-19	9	48.0
Process Water		8	20-Sep-19	03-Oct-19	21	80.0
Gland Water		2	21-Sep-19	24-Sep-19	2	32.0
Plant air		3	24-Sep-19	28-Sep-19	22	72.0
300 - INFRASTRUCTURE		66	27-Jun-19	30-Sep-19	28	336.0
HV Substation		3	27-Jun-19	02-Jul-19	60	88.0
LV switch rooms		19	02-Sep-19	30-Sep-19	24	72.0
PCS System		3	17-Jul-19	22-Jul-19	74	80.0
Decant Return		3	20-Sep-19	25-Sep-19	31	48.0
Sewage Handling		5	05-Aug-19	09-Aug-19	59	48.0
PROCESS COMMISSIONING		14	03-Nov-19	21-Nov-19	0	224.0
Process		14	03-Nov-19	21-Nov-19	0	224.0
KGP-IN-12830	Plant Process Commissioning	14	03-Nov-19	08-Nov-19	0	112.0
KGP-IN-12840	Performance Testing	40	08-Nov-19	21-Nov-19	0	112.0



Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Preliminary Baseline Schedule Development

P3540-000-SCH-001_B (Water Infrastructure Development)			
Date	Revision	Checked	Approved
30-Mar-17	Tulu Kapi Preliminary PEP - IFR	AB	PH